“CLINICAL STUDY OF DEFORMITIES IN NEWLY DIAGNOSED LEPROSY PATIENTS”

Dissertation Submitted in

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MD DEGREE IN

DERMATOLOGY, VENEREOLOGY AND LEPROSY

(BRANCH XX)

MADRAS MEDICAL COLLEGE

THE TAMILNADU DR. M.G.R. MEDICALUNIVERSITY

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APRIL 2016

CERTIFICATE

Certified that this dissertation titled **"CLINICAL STUDY OF DEFORMITIES IN NEWLY DIAGNOSED LEROSY PATIENTS"** is a bonafide work done by **Dr.H.DHANASELVI,** Post-graduate student of the Department of Dermatology,Venereology and Leprosy, Madras Medical College, Chennai – 3, during the academic year 2013 – 2016. This work has not previously formed the basis for the award of any degree.

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I, **Dr.H.DHANASELVI** solemnly declare that this dissertation titled " **CLINICAL STUDY OF DEFORMITIES IN NEWLY DIAGNOSED LEPROSY PATIENTS**" is a bonafide work done by me at Madras Medical College during 2013-2016 under the guidance and supervision of **Prof.K.MANOHARAN, M.D.,D.D.,**Professor and head of the department of Dermatology, Madras Medical College, Chennai-600003.

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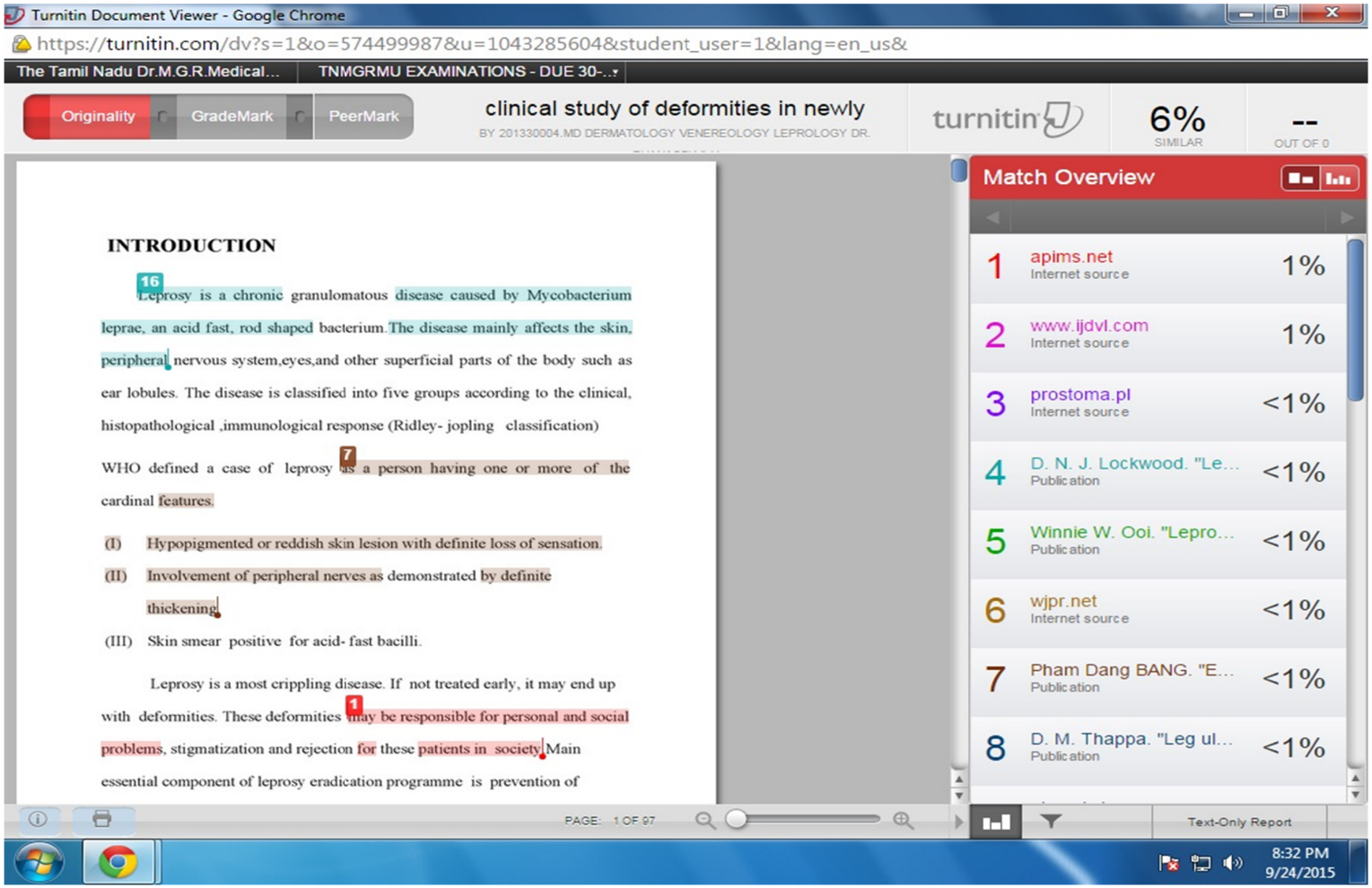
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INTRODUCTION
Leprosy is a chronic granulomatous disease caused by Mycobacterium leprae, an acid fast, rod shaped bacterium.The disease mainly affects the skin, peripheral nervous system,eyes,and other superficial parts of the body such as ear lobules. The disease is classified into five groups according to the clinical, histopathological ,immunological response (Ridley- jopling classification)
WHO defined a case of leprosy as a person having one or more of the cardinal features.
(I) Hypopigmented or reddish skin lesion with definite loss of sensation.
(II) Involvement of peripheral nerves as demonstrated by definite thickening.
(III) Skin smear positive for acid- fast bacilli.
Leprosy is a most crippling disease. If not treated early, it may end up with deformities. These deformities may be responsible for personal and social problems, stigmatization and rejection for these patients in society.Main essential component of leprosy eradication programme is prevention of
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CONTENTS

"CLINICAL STUDY OF DEFORMITIES IN NEWLY DIAGNOSED LEPROSY PATIENTS"

ABSTRACT

Aims and objectives :

To study the frequency and severity of the deformities with clinical and socioeconomical factors associated with deformities among the newly diagnosed leprosy patients and to highlight the importance of the health education to prevent the deformities .

Materials and methods :

This was a observational study carried out at leprosy op**,** Madras medical college and RGGG Hospital, Chennai. Newly diagnosed leprosy patients with deformities were included in the study after thorough clinical examination, routine and special investigations(slit skin smear, skin biopsy and nerve biopsy whenever necessary)

Results :

Out of 165 newly diagnosed leprosy patients ,50 patients had deformities , thus making disability and deformity index to be 30.3%.Males(70%) with lower lower socioeconomic group (42%)were commonly affected than females(30%).Lepromatous type of leprosy(30%) with more than two years(46%) were commonly affected. Multibacillary patients (84%) were commonly affected with deformities. The body parts affected in the cases were hands(78%), hands and feet(66%), feet(40%).Anesthetic(88%) deformities were more common followed

by specific(36%) deformities.Grade 1 (46%)deformities were most common followed by grade 2(40%) deformities.

Conclusion

The study showed that mostly patients developed deformities and disabilities due to delay in diagnosis, lack of treatment and health education.So, early diagnosis, proper treatment and health education to the patients, family, community and rehabilitation are the important ways to prevent the formation and to halt the worsening of the deformities.

Key words

Leprosy, disability and deformity.

INTRODUCTION

Leprosy is a chronic granulomatous disease caused by Mycobacterium leprae, an acid fast, rod shaped bacterium.The disease mainly affects the skin, peripheral nervous system,eyes,and other superficial parts of the body such as ear lobules. The disease is classified into five groups according to the clinical, histopathological, immunological response (Ridley- jopling classification)

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Leprosy is a most crippling disease. If not treated early, it may end up with deformities. These deformities may be responsible for personal and social problems, stigmatization and rejection for these patients in society.Main essential component of leprosy eradication programme is prevention of deformities.

Deformities are disease producing changes in the structures and functioning of certain parts of the body. Two types of deformities are encountered in leprosy patients.

Primary deformities are due to direct involvement of tissues and peripheral nerves with M.leprae while secondary deformities occurs as a result of damage to the anaesthetic parts of the body.Deformities range from mild degree such as small area of anaesthesia on the hands to a very severe degree such as disfigurement of the face, bilateral wrist drop, shortening of fingers, ulceration and fixed deformities of both feet and loss of vision in both eyes. Involvement of more than one part of the body may be considered as more severe than involvement of only one part of the body.

WHO GRADING OF DISABILITIES

S.no	Grade	Hands and feet	Eyes
1	0	No anaesthesia, no visible deformity or damage	No eye problem due to leprosy
2	1	Anaesthesia present but no visible deformity or damage	Eye problems due to leprosy present but vision not severely affected as a result of them
3	2	Visible deformity or damage present	Severe visual impairment

In India, disability rate vary from 10% -45% .The deformiies are seen more commononly association with the multibacillary leprosy than paucibacilary leprosy. Various factors might be associated with the presence of deformities.(ex. age, gender, literacy, occupation, residence, spectrum of disease). Hands and feet are to be most frequently involved and anaesthesia of the extremities are the most common disability.

The purpose of this study is to determine the frequency and severity of various deformities in newly diagnosed leprosy patients along with association of clinical and socio demographic factors and to highlight the importance of health education to the patient, their families, friends and community regarding rehabilitation for the deformities and to lessen worsening of deformities**.**

The study will be carried out after getting informed consent from the patients, with due respect to the Institutional Ethics and under the watchful supervision of my Guide and Co-guide.

Review of Literature

REVIEW OF LITERATURE

HISTORICAL ASPECTS OF LEPROSY

The leprosy is a disease which has multiple histories ranging from scientific-medical to legal and social asects. Even before 1400 BC disease like leprosy were recorded in Egypt . Greek word leper means scaly.Sushrutha Samhita first described leprosy in India and treated with marotti and chaulmoogra oil. In the vedic writings, leprosy has been named as Kushth[1]. Danielssen and Boeck published scientific study on leprosy in 1847. Carter from Mumbai casted leprosy as involvement of peripheral nerves [2].

Virchow described granulomas and lepra cells in the microscopic picture of the nodules from leprosy patients in 1864[3]. Armuer Hansen in 1873 discovered the mycobacterium leprae[4].

Paul Unna, german pathologist described grenz zone in histopathological sections in leprosy patient . Paul Ehrlich introduced aniline dyes for staining bacilli[5]. Ziehl substituted calbolic solution for demonstrating mycobacterium leprae [6].

Mitsuda of japan in the year 1916 introduced lepromin test[7]. Ernest Muir documented nerve abscesses in 1924 [8].Skin smear test was

introduced by Wade in 1927 and modified in 1947 by Cochrane[9]. During 1940s Dapsone drug was discovered by Muir and Cochrane[10].

Hogerzeil and Browne first used clofazimine . In 1963 Opromolla in Bracil introduced rifampicin[11] .

In the international leprosy conference neural, tuberculoid , lepromatous forms were described in the year 1938. Then Madrid classification, Indian classification (1955), Ridley - Jopling classification were described[12]. WHO proposed classification on basis of chemotherapy. NLEP in 1994 introduced 24 month fixed drug MDT and 12 month fixed drug MDT since 1998[13].

DEFINITION

Leprosy is slowly progressive, chronic granulomatous disease. It is caused by bacteria known as mycobacterium leprae. The disease is mainly affecting the peripheral nervous system, skin and other tissues.[14]

Leprosy is not confined to humans only. Naturally acquired disease also reported in chimpanzees, mangabee monkeys and armadillo. A report of leprosy developed in armadillo handlers in texas have been documented. Humans are the most important source of infection to other humans. It has labelled as zoonosis[15].

The South-East Asia accounts for 80 percent of the global leprosy cases. India represents 78 percent new case detection and 64 percent of prevalence worldwide[16]. In India most of the leprosy cases are found out in 11 endemic states , including Orissa, Bihar , Chattisgar , Jharkand and Uttar Pradesh where the prevalence rate is over 4 per 1000[17] .

Microbiology

1. General characteristics

Taxonomically M.leprae is classified under class – schizomycetes , order – actinomycetalis, family – mycobacterium genus –mycobacterium, species – leprae.

M.bacteria is slightly curved or straight rod shaped bacilli of size 1-7×0.3-0.5µm, gram positive, acid fast, obligate intracellular, non cultivable organism. The organism is usually occurring in parallel array, clumps as well as globi with hundreds of bacilli. It is gram-positive and acid fast, typicallly staining evenly and uniformly red with Zeihl - Neelsen's stain[18].

Leprous bacillus is found in different types of cells which are Macrophages, schwann cells of nerves, muscle cells, melanocytes of the skin, chondrocytes of cartilage and lining endothelial cells of blood vessels[19].

M.leprae is unique in that it is invading Schwann cells that is providing immunologically protected sites. Leprosy affects areas of the skin with low temperature like face, elbows, trunk and extremities .[20]

II. SPECIAL CHARACTERISTICS :

1) Acid-fastness :

Lepra bacilli are alcohol-fast as well as acid fast, and a mixture of alcohol and acid used in the standard method of staining, that is Ziehl-Neelsen. Acid fastness is because of the presence of unsaponifiable wax(mycolic acid).[21]

2) Pyridine extraction

Treatment of smears of M.leprae with pyridine destroyed their ability to stain subsequently with carbol-fuschin, and this phenomenon was unique to M. Leprae[22] .

III. BIOLOGICAL PROPERTIES :

1) **Generation time**- 11-13 days

2) **Optimum temperature requirement** : 27-30°C

3) **Minimal infective dose** :

Ranging from 40 to 43 bacteria. 24,25

4) **M. leprae viability**:

7-10 days in tissues(dry dessicated form) stored at 4°C[21].

IV. **BIOCHEMICAL PROPERTIES** :

1. **Capsule** :

The outer surface of M .leprae is made up of lipid components (wax ester phthiocerol dimycocerosate and phenolic glycolipid)[23].

2. **Cell wall** :

The cell-wall has a cross-linked peptidoglycan and the lipoarabinomanna . The pattern of cell wall associated mycolic acids distinguishes M. Leprae from other mycobacteria[24].

V. **METABOLISM** - M. Leprae is able to take up potential nutrients likely to be available in host cells like glucose, glycogen, aminoacids, thymidine, purine and inorganic phosphates[25].

VI. **ANTIGENIC STRUCTURE**

Among 20 different antigens, only 2 determinants specific to M.leprae (PGL-1 , lipoarabinomannan) have been purified[26].

VII. **CULTIVATION**

The two chief animals - mouse and nine banded armadillo (Dasypus novemcinctus) are important in cultivation of M.Leprae[27].

TRANSMISSION FACTORS :

1) **Source of infection** :

The human being is the only known reservoir of infection in leprosy. Lepromatous and near lepromatous pole are the main source of infectio ,the tuberculoid cases being infective during reactions[28]

2) **Portal of entry** :

The two portals of entry are the skin and upper respiratory tract. Of these two, the respiratory route appears most probable route[28].

3) **Incubation period** :

Leprosy has a long incubation period, an average of 3 to 5 years or more for lepromatous cases. The tuberculoid leprosy is thought to have a shorter incubation period[18].

4**) Portal of exit** -1. The nose is a major portal of exit.

2. Ulcerated or broken skin - other routes of exit

Modes of transmission :

a) Infection via the skin - 1.Direct skin to skin contact,

2.Transmission by flies and other arthropods.

b). Infection via the gastro-intestinal tract

c) Infection via respiratory tract-The most important route of transmission being respiratory tract[29] .

PATHOGENESIS

Unique feature of leprosy is the involvement of peripheral nervous tissu . It will enter through the naked axons in the epidermis or in the superficial dermis following loss of the epithelium and travel up along the axoplasm .Then the bacilli invade the Schwann cells.

Pathogenesis of nerve damage :

M. leprae produce varying degrees of nerve damage at certain specified sites where they are palpable clinically.M. leprae grow well at a temperature lower than that of the body. So, M. leprae aggregate and multiply inside nerve tissue at the superficial sites

- Superficially placed nerves are easily traumatized by external injuries and some get entrapped in points in fibrosseous canals adding insult to inflamed and swollen nerves. Swelling of the nerve due to edema increase the intraneural pressure causing ischemia of the nervous tissue.
- Immune reactions- In tuberculoid neuropathy it is due to a delayed hypersensitivity reaction to M. Leprae antigens . In lepromatous neuropathy immune complexes play a significant role in nerve destruction especially during erythema nodosum leprosum (ENL) reaction[30].

CLINICAL FEATURES

Leprosy is unique chronic infectious disease as the spectrum of signs and symptoms that it exhibits are different.

The signs and symptoms of leprosy are related to three mechanisms

1. The multiplication and dissemination of M. leprae.
2. The patient's immune response to M.leprae and its antigens.
3. The complications of damage to peripheral nerves, which is due to the result of the first two processes. Clinical leprosy can vary from the presence of an insignificant area of hypopigmented skin that heals spontaneously to widespread damage to peripheral nerves,eyes, muscle, bone and other tissues, with deformity and disability[31].

The cardinal signs of leprosy :

There are three cardinal signs, any one of which, if present, is sufficient to establish a diagnosis of leprosy.

1. **Anaesthetic/hypoasthetic skin lesions** :

Macules or plaques or more rarely papules or nodules, in which there is a definite loss of sensation to light touch, pin prick or temperature. There may be other typical abnormalities of skin colour, texture or hair growth.

2. Enlarged peripheral nerves :

Enlarged peripheral nerves are very rarely found except as a result of leprosy. In a leprosy endemic area, the finding of definite enlargement of peripheral nerves is sufficient to establish a diagnosis[33].

3. Demonstration of Mycobacterium leprae in skin smears :

Bacilli are demonstrated in slit skin smears or in nasal mucous scrapings by Ziehl-Neelson staining method .

Bacillary index: [34] - Number of the bacilli in average microscopic field using an oil immersion objective(1000x magnification)

6+ many clumps of bacilli
5+ 100-1000 bacilli
4+ 10-100 bacilli
3+ 1-10 bacilli
} an average field

2+ 1-10 bacilli in 10 fields and 1+ 1-10 bacilli in 100 fields

CLASSIFICATION

The **Indian classification** includes 1. lepromatous ,2.tuberculoid, 3. maculoanesthetic, 4. Polyneuritic, 5. borderline, 6. indeterminate types of leprosy[35]. **New IAL classification** includes 1. lepromatous,

2. tuberculoid, 3. borderline , 4.indeterminate and 5.polyneuritic types[36] **. Ridley and jopling classification** defined five groups according to clinical , histological , bacteriological and immunological features 1. tuberculoid leprosy , 2. borderline tuberculoid , 3.midborderline, 4. borderline lepromatous, 5.lepromatous leprosy. Pure neuritic and indeterminate types of leprosy are not included in the classification [37].

WHO classification in 1988 classified into single lesion paucibacillary leprosy , paucibacillary leprosy(2 – 5 skin lesions), multibacillary leprosy(six or more skin lesions and smear positive cases). In 2009 under **NLEP** classification defined paucibacillary and multibacillary leprosy [38].

Sr. No	Characteristics	PB	MB
1	Skin lesions	1-5 lesions	6 and above
2	Peripheral nerve involvement	No nerve /one nerve with or without 1-5 lesions	More than one nerve irrespective of the number of the lesions
3	Skin smears	Negative at all sites	Positive at one site

Clinical manifestations of various spectrums of the disease:

Inderterminate type of leprosy :

One or a few slightly ill defined hypopigmented macules , commonly over the extensor surfaces of the limbs or buttocks or face

with slight or absent anaesthesia .Smears are negative, but occasionally bacillus can be demonstrated within a cutaneous nerve in biopsy.Sometimes a thickened nerve is palpable.This type may heal spontaneously, but about 30% progress towards the lepromatous end of the spectrum[39].

Tuberculoid leprosy (TT) :

Skin lesions are single or very few with sharp borders and may be macules or plaques(erythematous or coppery)with dry scaly surface with deficient /absence of hair and reduced sensation .A thickened nerve is usually palpable in the vicinity of a tuberculoid lesion. Skin smears and are negative[40].

Borderline tuberculoid leprosy (BT):

The skin lesions are hypopigmented with well defined margins that may stream off gradually into normal skin in few areas.The number of lesions is upto 20 or more with satellite lesions. Hypopigmentation, dryness , scaling , anaesthesia are less pronounced. Peripheral nerves are enlarged asymmetrically. Bacilli are scanty or absent in BT.Without treatment, BT leprosy may continue for many years with bouts of reaction, resulting in paralysis and deformity or downgrade to BL or LLs[41].

Borderline borderline leprosy (BB)

The most unstable part of the spectrum with many skin lesions (tendency towards symmetry). Skin lesions may be macules, plaques or papules with well defined to ill defined which may be very peculiar with streaming, irregular borders and satellites, presenting a polymorphic or geographic appearance with affected many nerves in an asymmetrical pattern. An important characteristic is the tendency to reaction with rapid damage to nerves and skin. Bacilli are always present in the lesions[41,42].

Borderline lepromatous leprosy (BL) :

The macules of BL are more distinct, variable in shape, and not perfectly symmetrical in distribution. As the disease progresses some of the macules become infiltrated,the skin surface feels irregular.The papules and nodules are more defined and less symmetrical than those of LL.Signs of nerve damage and enlargement of pheripheral nerves start sooner in BL than in LL.Bacilli are numerous in skin lesions[40].

Lepromatous leprosy (LL):

Patients may present with macules, papules, nodules. Skin lesions are multiple which is bilateral and symmetrical usually over the face, arms, buttocks and legs .Macules are erythematous / coppery sheen. They are small, numerous, have a shining surface and vague edges, and show

no loss of sensation or of hair growth. Thickening and nodulation of both ears are seen initially then, the skin of the face becomes generally thickened, the nose becomes swollen and broadened, eyebrows become thinned together with eyelashes[42].

As the untreated disease advances, thickening of the skin of forehead causes deepening of the natural skin lines (leonine facies), ear lobes are thickened, eyebrows are lost, the nose may collapse due to bacillary destruction of the bony nasalspine with hoarseness of Voice . Bilateral insensitivity of the extremities will be present as glove and stocking type of sensation and patchy sensory loss. [41,42]Damage to nerves occurs late in LL and manifests as nerve thickening with sensory or motor dysfunction . Infiltration of the upper respiratory tract mucosa is found in about 75% of new LL patients and the palate may get perforated. Early eye changes include corneal anaesthesia due to direct bacillary infiltration of corneal nerves and later due to damage to the ophthalmic division of the trigeminal nerve[41].

The hands and feet with swollen digits tending to taper towards the tips of fingers are seen. Testicular damage is insidious unless the testis becomes acutely inflamed during episodesof reaction.A large number of lepra bacilli are seen in the slit skin smears and nasal scrapings, mostly as globi[41,42]

Pure neuritic leprosy

Neuritic type of leprosy will present as peripheral neuropathy with no skin lesions with definite nerve enlargement. These type of patients are diagnosed by peripheral nerve thickening not by anaethetic patch[43] .4.6 % of newly diagnosed patients present with pure neuritic type of leprosy[44].

Histological classification and spectrum :

I) Tuberculoid leprosy (TT):

Epidermis is usually thinner than normal. The papillary zone does not appear as a clear band, but is invaded by foci of inflammatory cells. Dermis showsepitheloid cell granulomas consists of epitheloid cells, Langhan's type of giant cells surrounded by mild to moderate mononuclear cell infiltrate[45].

Acid-Fast Bacilli (AFB)-Absent/non viable bacilli in granuloma

II) Borderline tuberculoid (BT):

There is a free, narrow papillary zone and Epitheloid cell granuloma, more diffuse than tuberculoid leprosy, giant cells tend to be of foreign body type rather than Langhan's type in dermis[46]

AFB : Few may be found within the dermal nerves.

III) Borderline borderline leprosy :

The papillary zone is clear , narrow and diffuse epitheloid cell granuloma with scanty lymphocytes and no giant cells in the dermis. Dermal nerves show slight swelling and cellular infiltrate.

AFB : Bacilli are present in Dermis and within the dermal nerves[41,45].

Bacterial Index (BI) :3-4+

IV) Borderline lepromatous (BL) :

Clear papillary zone and macrophage granuloma in the dermis, in which some of the cells may show foamy changes and lymphocytes are present. Bacilli are plentiful, distributed singly or in clumps/ small globi[45,46].BI: 4-5+

V) Lepromatous leprosy (LL) :

There is clear subepidermal zone (Grenz zone). Dermis shows extensive cellular infiltrate, consists of foam cells or lepra cells, histiocytes , macrophages, few lymphocytes and plasma cells. AFB : Bacilli are found lying in bundles like pack of cigar or if degenerated in large clumps called globi[46].

BI: 6+.

VI) indeterminate leprosy :

Epidermis is normal, may show areas of atrophy. Dermis shows scanty infiltrate mainly composed of lymphocytes, found around the

adnexa with special predilection for nerves. There is no granuloma. AFB: A few or more bacilli are found inside a nerve[41,46].

VI.Pure neuritic type of leprosy:

Nerve biopsy -Histopathological findings

Macrophage/epithelioid granulomas, inflammatory infiltrates, +/- acid - fast bacilli[47]

Clinical examination:

General and cutaneous examination

Skin lesions

1. Number ,distribution, shape, size of the skin lesions(macule, patch, plaque , nodule) , presence of satellite lesions
2. Morphology of skin lesions -colou , surface, border, absence of hair and sweat, tenderness.
3. Palpation - gentle rolling of a finger along the borders to find out the feeding nerve

- Testing sensations
    i. Temperature - hot and cold water in both test tubes
    ii. Touch – wisp of cotton
    iii. Pain –pin prick , tip of ball-point pen in case of thicker skin
    iv. Distal extremities - glove and stocking type of anaesthesia
- Icthyosis, Sweating

- Trophic changes - calluses, trophic ulcers over the pressure points of the palms, soles and bony prominence points[48]

Mucosal examination - Oral mucosa – enlargement/infiltration, nodules
Nasal mucosa- crusts, perforation, bleeding

Ocular examination

i. Loss of eyebrows and eyelashes
ii. Blinking frequency, blink interval, palpebral fissure width[49]
iii. Photophobia, redness of eyes, watering of eyes
iv. Corneal sensation - tested with wisp of cotton wool
v. Corneal reflex - when the patient looks straight, examiner touches the cornea from one side and there will be brisk blink response.
vi. Pupil and visual acuity[50]

Palpation of peripheral nerves

Using pulp of fingers, nerves should be palpated. The following things should be noted - number, unilateral/bilateral, comparison of both sides, extent, nodularity, nerve tenderness, nerve abscess.

- ✓ Supraorbital nerve - palpating(thumbs) over the supraorbital notch
- ✓ Infraorbital nerve –using the thumbs over the infraorbital foramen just below inferior orbital margin
- ✓ Zygomatic branch – using the thumb over the zygomatic arch.

Elbow should get flexed at 90degree and examiner should hold the patient hand in hand shaking manner for the following nerves palpation

- ✓ Radial nerve – examiner's left fingers roll the nerve in the spiral groove on the humerus
- ✓ Ulnar nerve – examiner's little finger locate the nerve over the ulnar groove on the medial epicondyle of the humerus and palpate along the medial aspect of the forearm
- ✓ Radial cutaneous nerve - lateral border of the radius just proximal to wrist along the extensor pollicis tendon along the ulnar side of the anatomical snuff box
- ✓ Sural nerve- palpated using fingers over the posterior aspect of the leg between the two bellies of gastrocnemius above and tendoarchilles tendon below
- ✓ anterior tibial nerve – on the dorsum of the foot, lateral to tendon of extensor hallucis longus
- ✓ posterior tibial nerve - medial aspect of ankle between medial malleolus and tendoarchilles[51]

Musuloskeletal system examination

Face - wrinkling of the forehead, nasolabial groove,nasal contour , angle of the mouth deviation

UPPER EXTREMITY

- ✓ Deformities like claw hand / wrist drop
- ✓ Comparing the thenar and hypothenar eminence of the hands
- ✓ Guttering of the web and interosseus spaces
- ✓ Patient's pincer grip - holding small objects with tips of fingers
- ✓ Power grip tested by holding the rod tightly
- ✓ Hooding of the fingers , z thumb, shortening of the fingers, non functional frozen hand should be noted

LOWER EXTREMITY

Look for gait abnormality, any collapse of arch of the feet, wasting of small muscles of the feet, any toe shortening[48]

Examination of the muscles of the upper extremities

1. **Wrist drop** - tested by close fist and dorsiflex the wrist against resistence (wrist extensors - radial nerve)
2. **Ochsner's clasping test** – ask the patient to clasp the both hands. If the index finger of the affected side doesnot flex, it is known as benediction sign. (FDP and FDS - median nerve)
3. **Pen test** – patient's hand is kept flat over the table and ask to touch a pen which held slightly higher. If the thumb lies flat in the same plane of the hand, it is known as ape thumb deformity (ABP – median nerve)

4. **Opponen's test** – patient is asked to swing the thumb across the palm
5. **Book test** – patient should hold a book between both the hands by keeping the thumbs straight on its upper surface and the examiner is trying to pull the book in the opposite direction. If the flexion occurs at the distal interphalangeal joint on the affected side (weakness of adductor pollicis), It is known as froment's sign.
6. **Testing for lumbricals and interossei** - ask the patient to flex the fingers at MCP joints against resistance.

   Claw hand – hyperextension at MCP and flexion at IP joints

   Partial claw hand- 1^{st} ,2^{nd} ,3^{rd} or 4^{th} and 5^{th} fingers, only median or ulnar nerve involvement

   Complete claw hand – all fingers (both ulnar and median nerve)
7. **Card test** – Insert firm card in each web space serially. Paitent is grasping the card tightly while examiner tries to pull it to test for palmar interossei
8. Patient is instructed to spread out the fingers against resistance by examiner's hand for testing dorsal interossei [48,49]

Examination of muscles of lower extremities

1. **Foot drop** - patient should be asked to perform the following movements against resistance

a. dorsiflexion at ankle

b. extension of great toe

c. eversion of foot

(dorsiflexors of ankle, EHL, PL - common peroneal nerve)

2. Patient is instructed to adduct/abduct the toes against resistance for testing of intrinsic muscles of the foot (medial and lateral branches of plantar nerve)[48,49]

COMPLICATIONS OF LEPROSY

A). **Reactions in leprosy**

Three types of reactions are recognised

I.Type I lepra reaction (Reversal reaction):

Type I rection is due to delayed hypersensitivity reaction which is Seen in borderline leprosy where immunological status is unstable.

The features include

1.Existing skin lesions become erythematous, swollen and painful and warm to touch ,2.New lesions may appear ,3.Oedema of face, hands and feet. 4.Mild Constitutional symptoms ,5.Neuritis is prominent [52]

Type II Lepra reaction:((ENL)

Occurs in patients with LL and BL. It is because of type III hypersensitivity reaction (immune complex deposition). Attacks are often acute at first but may be prolonged or recurrent. Erythema nodosum leprosum manifest as painful transient red nodules occurring in crops

over the skin(face and extremities) that may suppurate or ulcerate and leaving behind bluish pigmentation [53]. Uveitis, dactylitis, arthritis, neuritis, lymphadenitis, myositis and orchitis may accompany ENL, or occur separately. Proteinurea develop and renal function may be temporarily impaired[54].

3.Type III reaction -Lucio phenomenon :(Leprosy Manchada)

Painful patches appear on the skin, they become purpuric, necrotic and ulcerated and finally develops a brown or black crust (eschar) which falls to leave a superficial atrophic scar[55].

II. **DEFORMITIES IN LEPROSY**

In the India, the term "illness of untouchability", is apt because it resonates with cultural meaning that helps to define the social effects of the disease.Leprosy remains one of the foremost causes of crippling deformities responsible for much of the social stigma. About 25% of leprosy patients who are not treated at early stage of the disease develop deformities that disfigure, stigmatize and could constitute the handicap for a person's whole life[56]. The prevalence of disabilities in leprosy patients as recorded in different countries varies from 15 % to 46.8 %.

Impairment

Impairment is defined as abnormality or loss of anatomical structure or loss of physiological function. Deformity is defined as the

alteration in shape, form or appearance of a part of the body like loss of eyebrows. Disability is the lack or inability to perform the normal action of the human being ex. personal care, mobility, communication behaviour. Handicap is defined as persistent disablement of persons that limit or prevent them from fulfilling their normal role in society like resulting in unemployment[57].

Deformities due to leprosy disease are resulting from skin or tissue infiltration as well as damage of nerves. Disabilities by skin infiltration are obvious over the face resulting in sagging of facial skin, wrinkling of face, enlarged lobules of ear and loss of eyebrows. Damage to the nerves resulting from reactions and neuritis presents with sensory loss or motor paralysis like claw hand [58]

Types of deformities

A.primary deformity

Primary deformity - Due to nerve damage like sensory loss and claw hand

B.Secondary deformity

Secondary deformities are due to anaethesia, injury and lack of self care like ulcers, contractures, shortening of hands and feet [59].

II.**Three kinds of deformities according to Srinivasan and Dharmendra**

A.**specific deformity** : Local leprosy pathology is responsible for this type of deformity

B.**Paralytic deformity**

Results from damage to motor nerves .

C.**Anaesthetic deformity**

Consequent to sensory loss and loss of sensibility. The insensitive parts suffer injuries which get neglected and infected because of lack of pain. Consequently, there is much tissue damage followed by healing with scarring and deformity[59]

Facial deformities

Facial involvement is more common in cases of lepromatous leprosy and due to delay in starting the treatment.

Specific deformities

Heavy infiltration of the facial skin stretches and destroys the elastic fibres of the skin resulting in heavy folding and fine wrinkling giving the prematurely senile appearance(sagging face)[60]

Paralytic deformities

Peripheral branches(temporal and zygomatic) of facial nerve supplying the forehead and eyelid muscles are damaged by M.leprae bacilli. when the borderline lesion over the face in reaction,the danger of facial nerve paralysis is more[61]. The intense inflammation and edema associated with reaction can destroy the facial nerve. Leprosy patients with facial nerve palsy have a characteristic facial asymmetry and drooping of the angle of mouth[62].

Eye

In leprosy patients eye involvement is therapeutically as well as prognostically important. Extraocular structures and anterior segment of the eye are generally affected than posterior segment structures by leprosy.

Eye manifestations are common in lepromatous leprosy with more than 15 years of duration. Madarosis will be common presentation[63]

Mechanisms for eye involvement

Iris temperature is 3.5˚C, thus making possible target for M.leprae .

1. Infiltration of cornea and iris ex.iris pearls
2. Infiltration of eyebrows and eyelashes ex.madarosis
3. Hypersensitivity response to M.leprae antigens iridocyclitis
4. Nerve damage ex.corneal ulcers, exposure keratitis[64]

Eye manifestations in leprosy

Extraocular :

Eyebrows

Madarosis – loss of eyebrows especially over the outer 2/3 of the eyebrows. In advanced cases total loss of eyebrows will occur. It is due to infiltration of M.Leprae.

Tear glands - chronic dacryocystitis, keratoconjunctivitis sicca[65]

Diseases of the eyelids

- Lagophthalmos

zygomatic branch of the facial nerve when crossing the malar eminence gets damaged by lepra bacilli. This branch supplys the orbicularis oculi muscles which is responsible for closure of eyelids. Damage to this nerve causes mild weakness to total paralysis of nerve resulting in lagopthalmos[66].

If associated with trigeminal nerve palsy resulting in corneal anesthesia,it manifest as dry eye, exposure keratitis, corneal ulcer, perforation and loss of vision. Preinjury factors that lead to increased risk of complications are the lack of a good Bell's phenomenon, corneal anesthesia and dry eye[64,67].

- Ectropion –outrolling of lid margin
- Entropion –inrolling of lid margin.May be associated with trichiasis

Ocular lesions

Diseases of the conjunctiva and sclera

Conjunctivitis - inflammation and redness of conjunctiva

Scleritis - localised area of erythema and tenderness of the sclera

Episcleritis - painful nodule at the lateral aspect of the corneal limbus

Diseases of the cornea :

Manifested by infiltration of bacilli.

1.corneal pearls, 2.superfical punctate kearatitis, 3.corneal ulcers, 4.corneal perforation, 5.corneal opacity, 6.pannus formation[68]

Uveal tract involvement - infiltration and hypersensitivity reaction to the bacteria

1.iris pearls - round, white, shiny, tiny nodules

2.acute iridocyclitis - red eyes, watering of eyes, photophobia, constricted pupil, pain, diminished vision. Early diagnosis by slit lamp examination

3.chronic iridocyclitis

4.pan uveitis

Diseases of lens

Cataract - more common in cases of multibacillary patients

1.age related

2.recurrent / chronic uveitis

3.steroid therapy for reversal reactions[67,68]

WHO Grading of Eye complications(1982)[69]

Grade I - Conjunctivitis, madarosis

Grade II - Blurring of vision, iritis, keratitis, lagopthalmos

Grade III - Severe loss of vision, blindness, enophthalmos

Ear

Buddha ears

Heavy infiltration of the bacilli stretches and loosens the skin of the external ear . It gives the appearance of the buddha ear.

Rat bitten appearance

In eythema nodosum leprosum , the external ear is involved and gets damaged by ulceration and chondritis.The rim of the pinna becomes irregular and scalloped due to loss of the skin and bits of the cartilage giving a rat-bitten appearances[66,70].

Nose

Infiltration of the nasal structure leads to the development of sunken nose deformity[70].

Deformities of hand

Anaesthetic deformities

1. Numbness and tingling sensation of the palms
2. Senory loss over the ulnar side of little finger, palmar aspect of medial 1/3 of hand and the dorsum of ring and little finger
3. Blistering over the anaesthetic areas
4. Ulcers over the anesthetic areas
5. Scarring of the fingertips due to open wounds, sepsis , subcutaneous necrosis

6. Deformity and destruction of the tissues occur due to excessive and unreasonable strains[71]

Specific deformities

Reaction hand

Repeated episodes of reactions result in swollen fingers, stiff hand and partly flexed wrist. Digital skin is thin, atrophic, and adherent to the deeper structures.

Intrinsic plus deformity : Reverse of claw fingers

Frozen hand

On resolution of reactions, the pull exerted by fibrosis in different directions result in frozen hand .

Twisted fingers

Pathological fracture at the juxta-articular position due to Osteoporosis because of reactions leads to tliting of bones. So, fingers are bent or twisted in any direction

Swan neck deformity

Hyperextension at the interphalangeal joints and flexion at the tip of the finger[72].

Paralytic deformities

1.clawing of thumb - hyperextension at the MCP joints

2.Clawing of fingers - MCP joints of the fingers are getting hyperextended

3.**claw hand**

Ulnar nerve damage paralyse the intrinsic muscles of hand . The force exerted by extensors pull the metacarpophalangeal joints in extension and compensatory flexion at the proximal interphalangeal joints. If only ulnar nerve is involved ring and little fingers are involved (partial claw hand). If both ulnar and median nerve are involved, ape –thumb deformity and claw of all fingers (total claw hand) results.

4.Flattening of hypothenar and thenar eminence

5.Wasting of interossei produces characteristic depressions on the dorsum of the hand

6.Wrist drop – extensors of wrist affected[73,74]

s.n	nerve	Muscles paralysed	deformity	Sensory loss
1	Ulnar nerve	Palm -all interossei and lumbrical for ring and little fingers,Adductor pollicis Elbow -all of the above plus FCU and FDP of little and ring finger	Clawing of ring,little fingers Z pinch As above	Palmar aspect of little finger and hypothenar area As above and anaethesia on the dorsum of ring and little fingers[75]
2	Med-ian nerve	Palm-Thenar muscles Forearm-Long flexors of thumb and fingers	Loss of opposition abduction of the thumb active flexion of fingers is lost	Palmar aspect of thenar eminence, index and middle fingers As above
3	Radial nerve	ABL,finger wrist extensors	Finger clawing Wrist drop	Dorsum of web of thumb[75]

DEFORMITIES OF FOOT

Paralytic deformities

Clawing of the toes

Loss of intrinsic muscles of the foot causes clawing of the toes.

Foot drop

Paralysis of common peroneal nerve causes foot drop (plantar flexion of foot and fingers, inversion of the foot)[76]

sn	Nerve	muscles	deformity	Sensory loss
1.	Common peroneal nerve	Dorsiflexors and evertors of the foot	Foot drop	Dorsum of the foot,upper 1/3 of leg
2	Posterior tibial nerve	Intrinsic muscles of the foot	Clawing of toes	Sole of the foot[75]

Anaesthetic deformities of the foot

Paralytic deformities predisposes toulceration under the metatarsal heads. Eversion of the foot predisposes to ulceration on the lateral border of the foot.

1.numbness and tingling sensation over the feet

2.asymptomatic blisters over the feet

3.callosities over the feet[77]

4.**trophic ulcers**

Factors predisposing:

1.**Sensory loss**

a.Pressure necrosis

Prolonged pressure over the subcutaneous tissue leads to vascular compromise. Hence, progressive ischemia leads to subcutaneous fat necrosis later, the overlying skin is breaking down and discharging the necrotic material resulting in an ulcer

b.**Force** :

The force required for work is out of proportion to what is actually required and results in injury

c.**Loss of protective influence** :

thermal and mechanical injuries are tolerated to such extent to cause tissue damage

2.**Muscle paralysis**

Paralysis of muscles leads to abnormal posture as a result of which abnormal pressure points are developed which causes tissue injury[77,78]

3.**Autonomic nerve injury**

i. Dilatation of arterioles resulting in deficient oxygenation which impairs healing

ii. no effective contraction of arterioles after injury

iii. Due to loss of autonomic damage , there is loss of sweating . so the skin will be dry , brittle and fissured easily. It gets infected leading to ulceration

3.**Scar tissue formation**

i. scar tissue is relatively less vascular. So, when injured the defective oxygenation does not allow the ulcer to heal rapidly

ii.because of the scar tissue , the skin does not slide over while walking[77]

4.**primary vascular insufficiency-** Thickening and obliteration of vessel lumen may be responsible for delayed healing

5.**Direct action of M.leprae**

LL shows thinning of the cortical bone and cystic changes within them. They get fractured easily along with necrosis of bones.The subsequent sequetra formation beneath the base of the ulcers may lead to chronicity of the ulcers

6.**secondary infection** [78]

Trophic ulcer - common sites

1.head of the 1st metatarsal ,2.Big toe – midportion of plantar surface,3.Base of the fifth metatarsal ,4.heel,5.tips of the clawed toes[79]

Three kinds of manifestations

1.**Threatened ulcer**

a.minimal edema over the dorsum of the foot

b.slight splaying of the toes

c.deep tendernss

2.**Concealed ulcer** - blisters over the pressure points

3.**Manifest ulcer** - blisters will rupture and forms the ulcer[80]

Morphology of the ulcer

Ulcers are large, punched out or flask shaped with necrotic floor and overhanging necrotic edges with hyperkeratotic rim . Extension of the ulcer leads into osteomyelitis. The most important complication of trophic ulcer is squamous cell carcinoma. Cauliflower like growth in chronic ulcers must be biopsied to rule out malignancy[78]

WHO - Grading of disabilities (1970)[81]

S no	Grade	Hands	Feet	Eyes
1	Grade 1	Insensitive hand		
2	Geade 2	Ulcers and injuries Mobile claw hand Slight absorption	Trophic ulcers Claw toes and foot drop,Slight absorption	Lagophthalmos Blurring of vision Inflammation of globe
3	Grade 3	Wrist drop Clawing , stiffening of fingers ,Severe resorption of fingers	Contracture Resorption of foot	Severe loss of vision

WHO grading of deformity index –hands, feet and eyes

Hands and feet :

Grade 0 - No anaethesia , no visible deformity or damage

Grade 1 - Anesthesia present , but no visible deformity or damage

Grade 2 - visible deformity or damage present

Eyes

Grade 1 - No eye problem due to leprosy , no evidence of visual loss

Grade 2 - eye problem due to leprosy present , but vision not severely affected (vision 6/60 or better)

Grade 3 - severe visual impairment (vision worse than 6/60) lagophthalmos , iridocyclitis, corneal opacities[82]

Factors that affect the onset and progression of disabilities

1.**Age** - 20- 40 years age group are more commonly affected

2.**Sex** - Less common in females because of low incidence, milder forms, less involvement of nerves .

3.**Duration of the disease** - If the duration of the disease is shorter, the number of the deformities will be low[83] .

4.**Disease spectrum and immune status**

Nerve damage occurs earlier in case of tuberculoid type of leprosy . Reactions of leprosy(nerve damage) is more common in BL type of leprosy

5. **Occupation** - Heavy manual labourers and homemakers are at a higher risk of developing deformities

6.**Treatment** - Early diagnosis and treatment will decrease the risk [83]

WHO recommended regimens for PB and MB disease as per 1988 guidelines[84]

Paucibacillary cases	Rifampicin 600 mg once monthly supervised, plus dapsone 100mg daily, unsupervised, both given for 6 months
Multibacillary cases	Rifampicin 600 mg once monthly supervised clofazimine 300 mg once monthly, supervised, and 50 mg daily unsupervised plus dapsone 100 mg daily unsupervised. All medications are continued for at least2years

7. Availability of medical care – In remote areas without medical facilities deformities are more common

Evaluation and assessment of deformity

Assessment of deformity should be done at the first visit of the patients and information should be collected to assess the functions of the nerve. Complete clinical examination should be carried out regarding the condition of the nerve trunks, skin , sensory and motor functions[85] .

Prevention of impairments and deformities[86]

Interventions that are aimed at preventing the occurrence of a new disability or deformity not already present at that time when the disease is diagnosed. Efforts should be taken to recognise early signs of nerve damage and eyes. Supportive, preventive and treatment measures should be given

Prevention of worsening of disabilities[86,87]

Interventions that aimed at preventing the occurrence of a new disability or deformity not already present at that time when the disease is diagnosed

1.Expecting the impairment of nerve function **:**

Identify high risk patients – previous nerve damage,borderline leprosy patients , postpartum , pregnancy and intercurrent illness

2. Steroids - To treat the episodesof reactions

3 . Decompression of nerve – nerve damage around 3 months duration with muscle power grade 3 hav a good prognosis

4.Care of eyes – eyes should be examined regularly and referred to ophthalmic surgeon whenever needed .

5. Management of reactions – In reaction with neuritis steroids should be started without any delay.

6.Monitoring - patient should monitor themselves and report to the physician

7.Health education – very important in preventing as well as to arrest the progression of the deformities [87]

Health education

Advice to the patients with sensory loss over the hands and feet[88]

1.Always touch the hot vessel with hands and feet using clothes

2.while washing vessels and clothes , use your hands with gentle care

3.While cooking , use a thick cloth for lifting the vessels

4.Use wooden handled tongs

5.Avoid smoking

6.If patient is a smoker ,advice to use holder to fix with cigarette

7.While working , use gloves and clothes over the axe in the fields .

8.Always wear footwear

9.Wear titched comfortable shoes

10.Don't walk over the roughed/ tarred surface

11.Daily visualisation of hands and feet for any injury

12.Don't ignore any njury to your feet and hands

13.Consult the doctor as soon as u sustain any injury

14.Keep the hands and feet always moist

15.Rub the hands/feet with few drops of neem oil

16.Otherwise use the moisturising cream

17.Always use mirror to see the soles for any redness

Advice to the leprosy patients with deformities[88]

1.Follow the above advice

2.At home , follow the simplest physiotherapy exercises

3.Deformity is because of the disease consequence

4.Deformity is correctable or reversible

5. It is not spread by contact

6.Prevent worsening of the deformities

7.consult the doctor immediately

Advice regarding MB – MDT[84,88]

1.Longer time will be taken for the skin patches to disappear

2.clofazimine will cause dark coloured skin

3.Even after completing MB-MDT , reactions in the nerves and skin may occur

4.If the skin lesions become red coloured ,report to the doctor

5.If there is sensory loss over the hands and feet , report to the physician

6.Numbness , heavy feeling and tingling sensation will be signs of neural damage

Advice regarding management of plantar ulcers[89,90]

1.Self care kits should be used for managing the plantar ulcers

1.Scrapper, 2.Antiseptic cream , 3.Antiseptic solution, 4.Sterile gauze piece , 5.Oil or vaseline

2.Foot scraper - use for scrapping thick edges of the ulcer

3.Scraper should not be used over the dorsal surfaces

4.Don’t scrape too much

5. An antiseptic solution added to the water for soaking purposes

6.Sterile ointment application over the ulcer

7.After placing the sterile gauzes , put bandage

8.Dont use many sterile gauzes for dressing

9.Don’t apply tight bandaging

10.Put three rounds of dressing

Advice regarding eye care [88,91]

1.Every 6 months , regular eye check up should be done

2.If there is any eye symptoms , report to the doctor immediately

3.Wear protective eye glasses

4.Passively close the eyelid after lying down for sleep

5.Use artificial eye drops in cases of lagophthamos

6.Do surgeries as if advised by the ophthalmologist

Management

The aims of treatment of 'Reaction Hand' are achieved by

1. Steroid therapy
2. Splinting the hand in the functional position.
3. Elevation of the hand.
4. Frequent application of heat through wax baths.
5. By graded introduction of passive movements as soon as acute inflammation starts subsiding, followed by progressively increasing movements[92].

Correction of paralytic deformities of the hand :

Paralytic deformities of the hand are reversible if motor paralysis is detected before the nerve is completely paralysed or at least within a few weeks after complete paralysis of the nerve by[93]

1. Initial treatment with higher doses (60mg) of corticosteroids for 2 or 3 weeks. Then corticosteroids in doses equivalent to 30 mg of prednisolone daily for a few months.
2. Antileprosy chemotherapy.
3. Use of splints to prevent stretching of weak and paralysed muscles. (gutter spilnt,finger loop splint, opponens splint, adductor band)
4. Surgical decompression of the nerve
5. Corrective surgery

i.Pre-operative physiotherapy - Oil massage,exercise, wax baths, splinting ii.Passive stretching and serial splinting (Cylindrical finger splint, dynamic splint) when contracture is already present

iii. By corrective surgery one aims to readjust the force such that the affected joints are stable in the desired positions[93,94]

Operative procedure :

Patient with visible deformities should be referred to orthopaedic surgeon for surgical procedures.

1.Srinivasan's extension division graft operation.

2.Brand's operation.

3.Transfer of extensor carpi radialis longus and palmaris longus.

4.Multiple tendon transfer for - triple nerve paralysis.

5.Zancolli's operation for mobile hands.

6.Bunnell's flexor superficialis transfer for stiff hands

7.Tendon transfer procedure using Lasso operation[95,96]

Management of deformities of foot

Foot drop and claw toes

1.Strengthening of dorsiflexors - tying minimal load over the foot and slowly ask the patient to dorsiflex

2.Correction of the inversion action of the posterior compartment muscles - Standing on the slope for 15 minutes daily

3.A bandage cloth is tied in a such manner that patient can himself dorsiflex the foot

4.Using foot drop splint at the earliest weakness of the legs.

5.Commonest foot drop splint – spring splint attached to the MCR chappals[97].

6.Claw toes can be corrected by reconstructive surgery with long flexors to extensor transfer.

7.Neuropathic foot can be managed by triple arthrodesis[98].

Management of facial deformities :

- Depressed nose - 1.Antia inlay graft and 2.nasolabial flaps
- Wrinkled face - facial lift procedures
- Madarosis - full thickness hair graft
- Lagopthalmos - Temporalis musculofacial sling

Lateral tarsorrhaphy[89]

Management of plantar ulceration

Treatment of acute ulcers :

1. Mechanical cleaning : ulcer debridement, drainage procedures and irrigations.
2. Appropriate systemic antibiotics when there is failure to control the local infection.
3. Keep the foot elevated and all weight bearing should be prohibited[94].

Treatment of chronic ulcer :

1. Make sure whether the ulcer is complicated or not .
2. Plaster cast encasing the foot and leg for at least 6 weeks.
3. when the cast is finally removed, protective footwear is given. The patient should be instructed on the care measures and ulcer preventive practices[99].

Treatment of ulcers with infection in deeper structures :

1. It must be treated as an acute ulcer
2. After the subsidence of the acute stage, ulcer debridement should be done and wounds are laid open.
3. A few days after ulcer debridement, the patient is provided with a below knee plaster cast and treated as a case of chronic ulcer.
4. When deformities complicate the ulcer, it is best to get the ulcer healed first and then correct the deformity.
5. Cauliflower growths associated with chronic trophic ulcer are dealt by local excision and providing skin cover with split thickness skin grafts or by conservative amputation.

   Histopathological examination of the deeper parts of the growth is essential for ensuring that it is not malignant[99,100].
6. Prevention of plantar ulceration by protective footwear

   eg : Microcellular rubber footwear.
7. Foot care measures - skin care, injury care, walking care practices

Aims and Objectives

OBJECTIVES / AIMS

1. To study the frequency and severity of the deformities among the newly diagnosed leprosy patients.
2. To study clinical and socio demographic factors associated with the deformities.
3. To highlight the importance of the health education to the patients regarding rehabilitation for the deformities and to lessen the worsening of the deformities.

Materials and Methods

METHODOLOGY
(MATERIALS & METHODS)

All newly diagnosed leprosy patients with deformities who presented at the Hansen opd in our RGGGH hospital are included.A detailed history taking and clinical examination are carried out and all the patients are subjected to routine blood investigations and slit skin smear.Suspicious cases of leprosy are subjected to skin biopsy and nerve biopsy for confirmation of the diagnosis.Nerve conduction studies and neurological evaluation are done to exclude other neurological causes in selected cases. Xray , orthopaedic and ophthalmological evaluation are done in selected cases.Data collected are entered and analysed according to the WHO grading of disability and deformity index**.**

SUBJECT SELECTION

INCLUSION CRITERIA: Newly diagnosed leprosy patients with deformities attending Hansen opd in RGGGHospital are included.

EXCLUSION CRITERIA:

(1) Deformities due to other causes.

(2) Already and irregularly treated cases.

(3) Patients not willing for inclusion in the study

SCREENING PROCEDURES / VISITS:

Newly diagnoesd leprosy patients with deformities are selected and subjected to study.

Slit skin smear and other routine blood investigations are done. Skin biopsy, Nerve biopsy, nerve conduction studies, X-ray, orthopaedic, neurological and ophthalmological evaluation are done in selected cases.

FOLLOW UP PROCEDURES/VISITS:

Patients are advised to come for review after 1 to 2 weeks according to the investigations taken and following regular intervals during treatment. The reports of all the investigations and opinion are collected and recorded.

RESULTS:

Statistical analysis plan:

Data obtained will be analysed according to WHO grading of disability and deformity index

Observation and Results

OBSERVATION AND RESULTS

SEX DISTRIBUTION OF DEFORMITIES

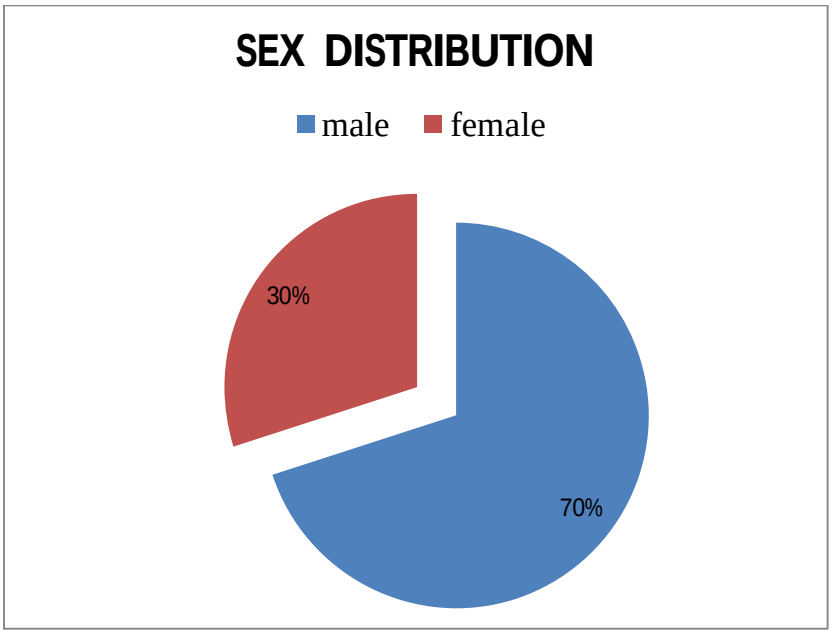
50 newly diagnosed leprosy patients with deformities fulfilling the inclusion criteria were enrolled in the study.

Out of these 50 patients, 35(70%) were males and 15(30%) were females. Thus deformities were more common in males than females with male:female ratio as 7:3.

Table 1 : SEX DISTRIBUTION (N=50)

MALE	FEMALE
35	15

FIGURE : 1 SEX DISTRIBUTION



AGE DISTRIBUTION OF DEFORMITIES

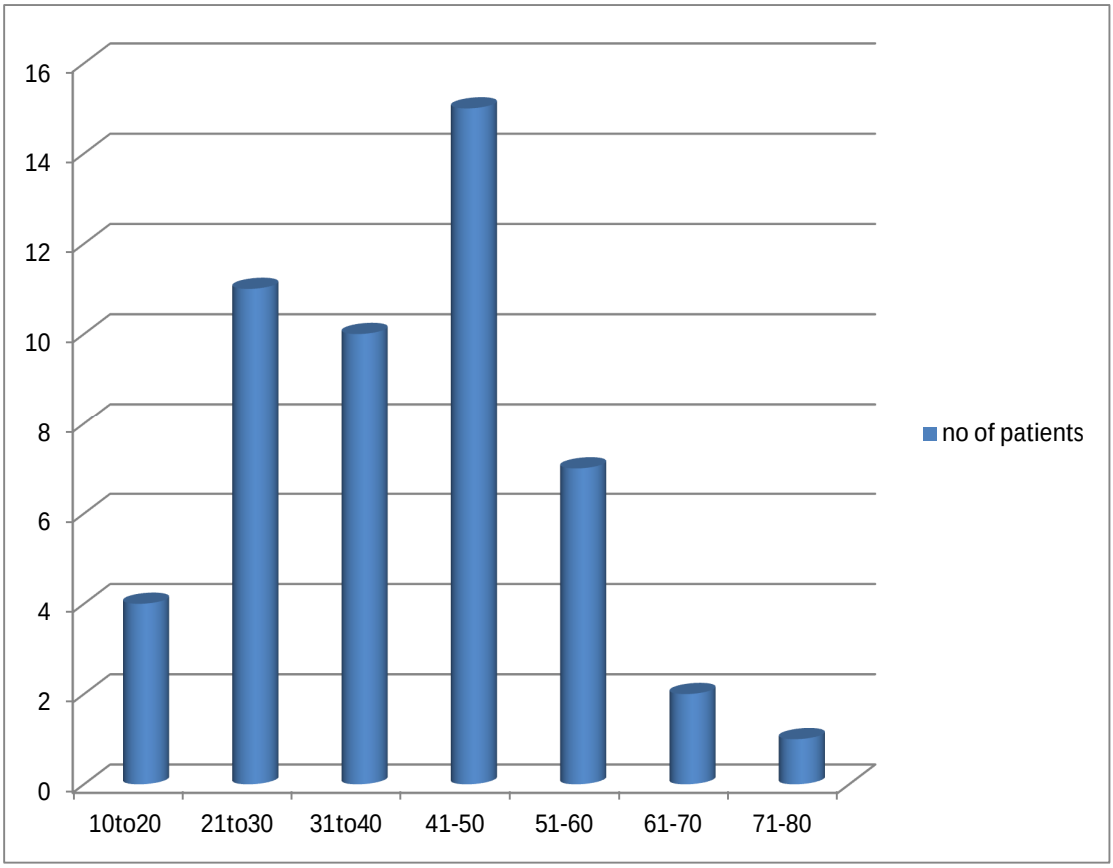
The age of the patients ranged from 10 to 70 years. The most commonly affected age group was 41-50 years with 15 (30%) patients, closely followed by 20-30 years age group with 11 (22%) patients .

Thus deformities were most common in the age group of 41-50 years.

Table 2: AGE DISTRIBUTION

AGE	n=50
10-20	4
21-30	11
31-40	10
41-50	15
51-60	7
61-70	2
71-80	1
TOTAL	**50**

Figure 2 : AGE DISTRIBUTION



Age in years

SEX WISE AGE DISTRIBUTION OF DEFORMITIES

Maximum number of affected males were in the age group of 21-40 years with total of18(36%) .

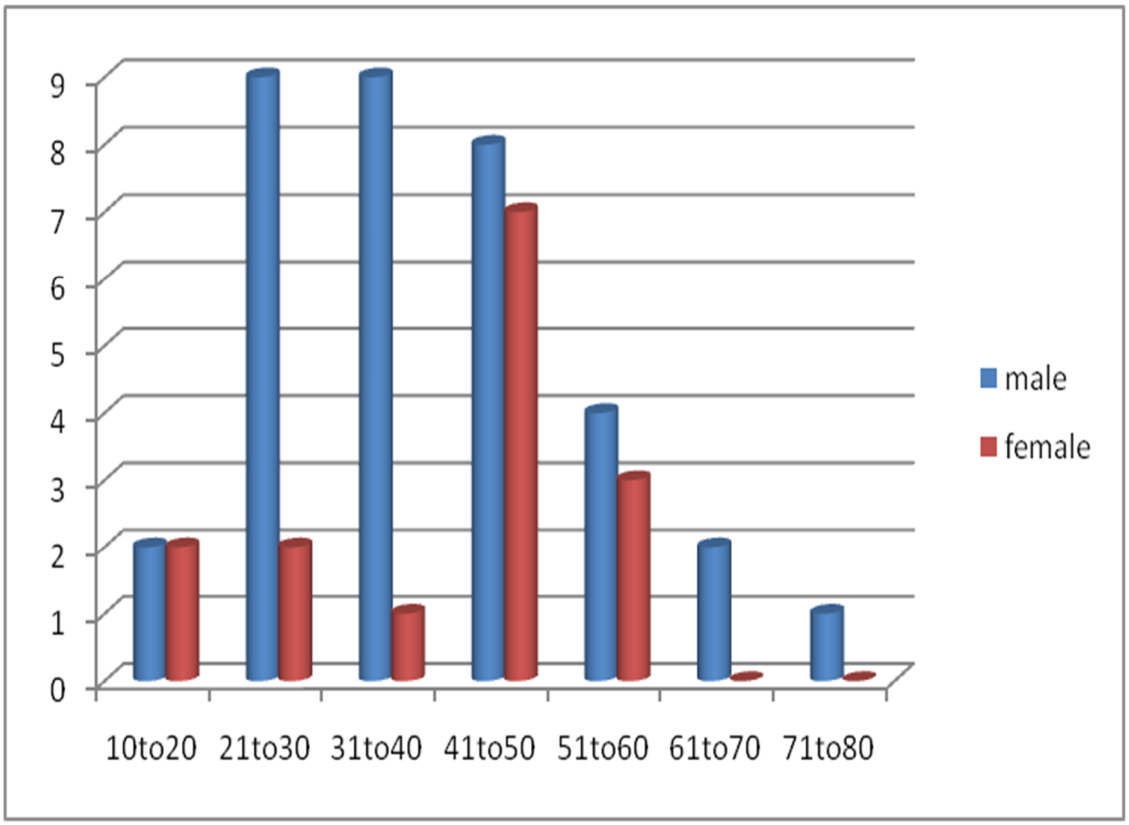
It was followed by 41-50 years with total of 7(14%) males and 51 to 60 years with 4(8%) males

Females were affected more in the age group of 41 to 50 years with a total of 8 (16%) women in this age group, followed by 51 to 60 years group with 3 (6%)patients(Figure 3).

Table 3: SEX WISE AGE DISTRIBUTION

AGE	MALE	FEMALE
10-20	2	**2**
21-30	9	2
31-40	9	1
41-50	7	8
51-60	4	3
61-70	2	0
71-80	1	0
TOTAL	**35**	**15**

Figure3: SEXWISE AGE DISTRIBUTION



SOCIOECONOMIC STATUS

Deformities were common in lower lower group (42%) followed by upper lower group(28%).

Table : 4

Socioeconomic status	No of cases
Upper middle	6
Lower middle	9
Upper lower	14
Lower lower	21
Total no cases	50

Figure : 4

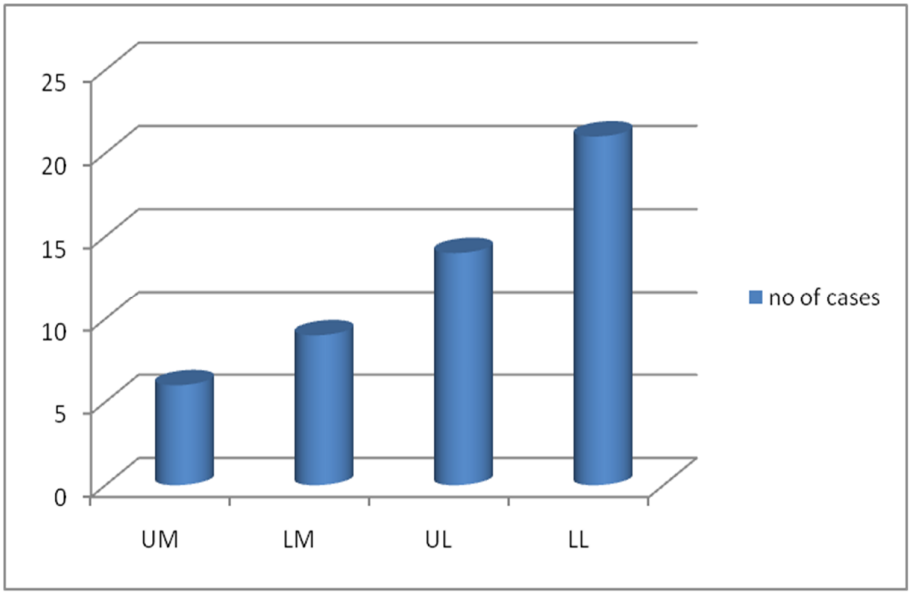
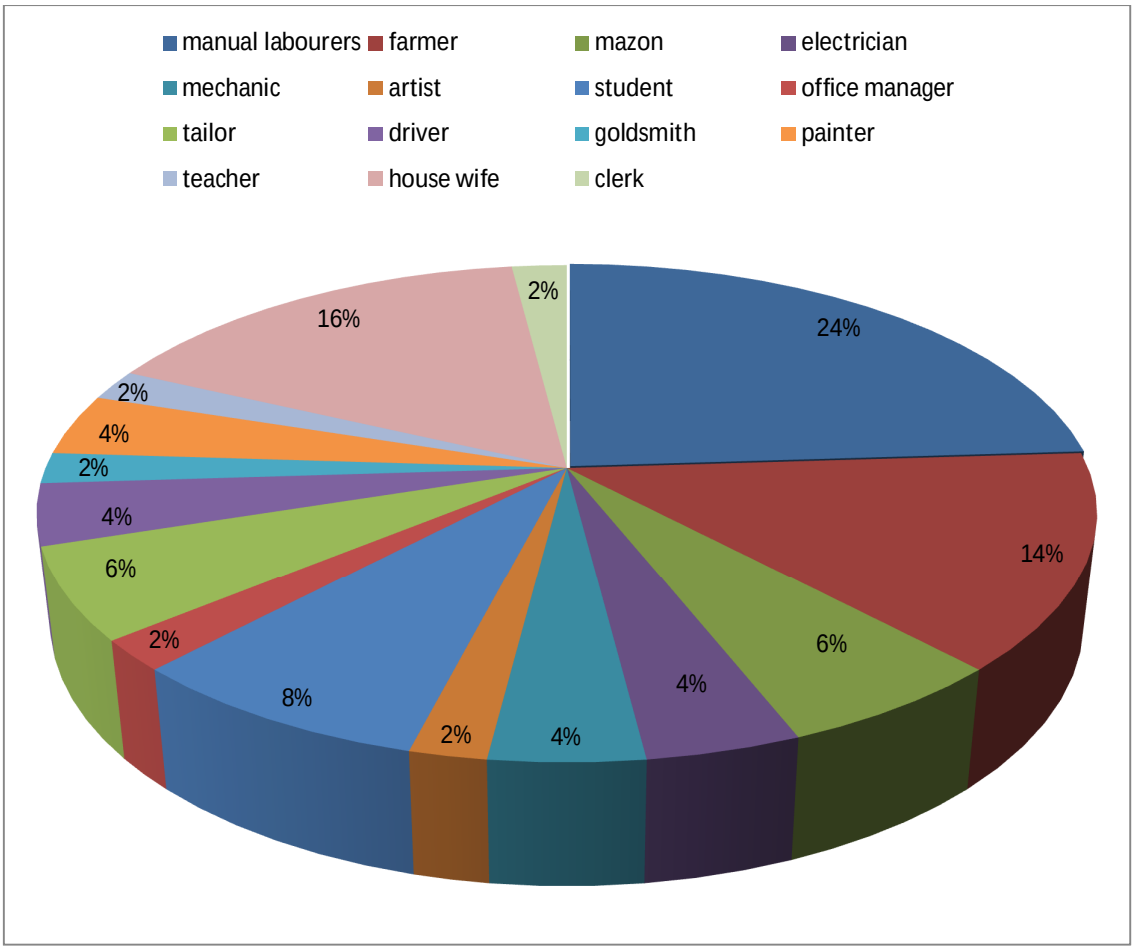


Table 5 : OCCUPATION OF PATIENTS WITH DEFORMITIES

OCCUPATION	NO OF PATIENTS
Manual labor	12
farmer	7
mason	3
Electrician	2
mechanic	2
artist	1
student	4
Office manager	1
Tailor	3
driver	2
Gold smith	1
Painter	2
teacher	1
House wife	8
clerk	1
Total	**50**

Manual labourers (24%) were the most common occupation with deformities followed by housewives(16%) and farmers(14%)

Figure 5 : OCCUPATION OF THE PATIENTS WITH DEFORMITIES



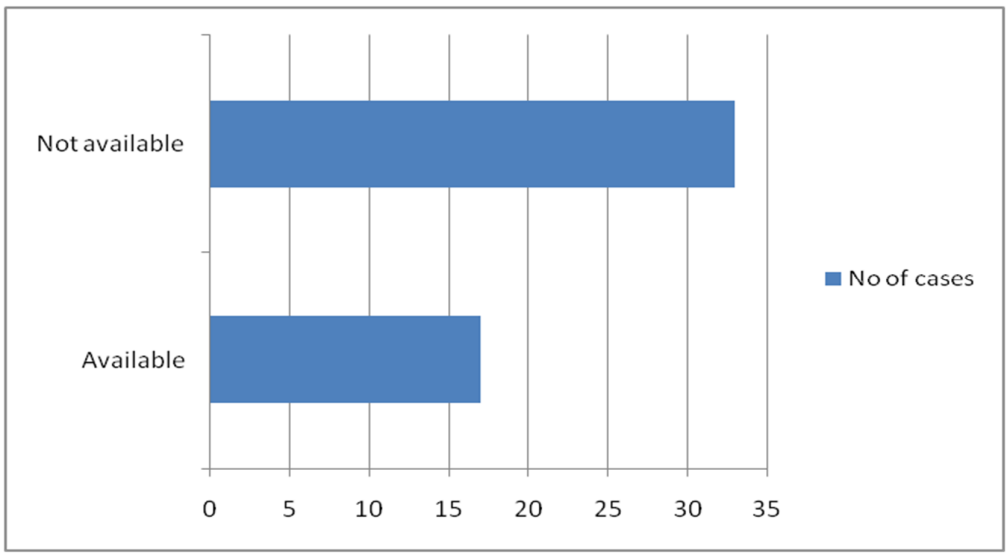
Medical care availability

Medical care was not available in 33 cases with deformities at their own places.

Table : 6

Medical care availability	No of cases
Available	17
Not available	33

Figure : 6



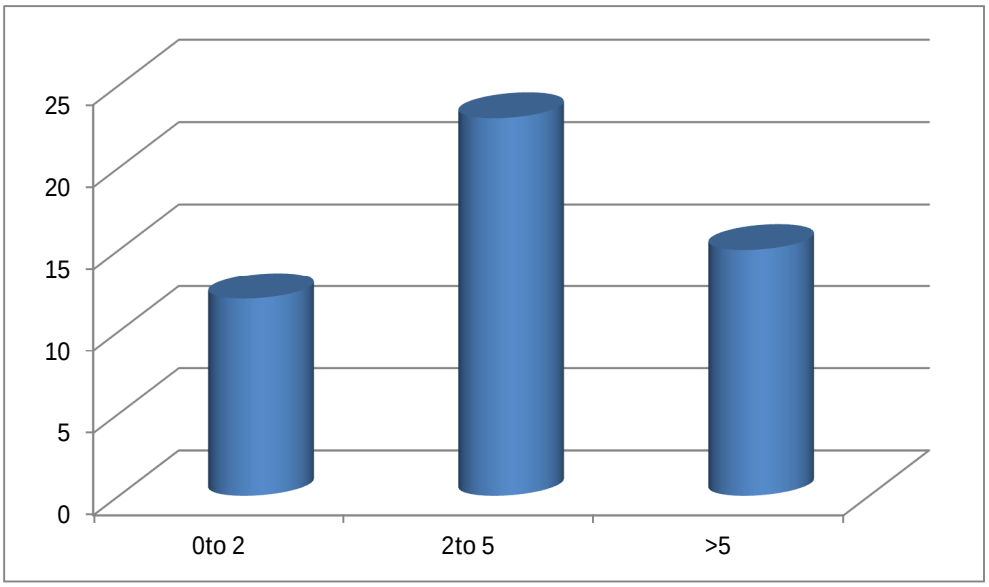
DURATION OF THE DISEASE IN PATIENTS WITH DEFORMITIES

Deformities were being highest in the disease with duration of more than 2 years followed by 5 years. Deformities were lowest in 0-2 years duration group.

Table 7: Duration of the diease in patients with deformities

Duration of the disease in years	No of the patients
0 - 2	12
2 - 5	23
>5	15
total	50

Figure 7 : Duration of the disease in patients with deformities



Duration of the disease in years

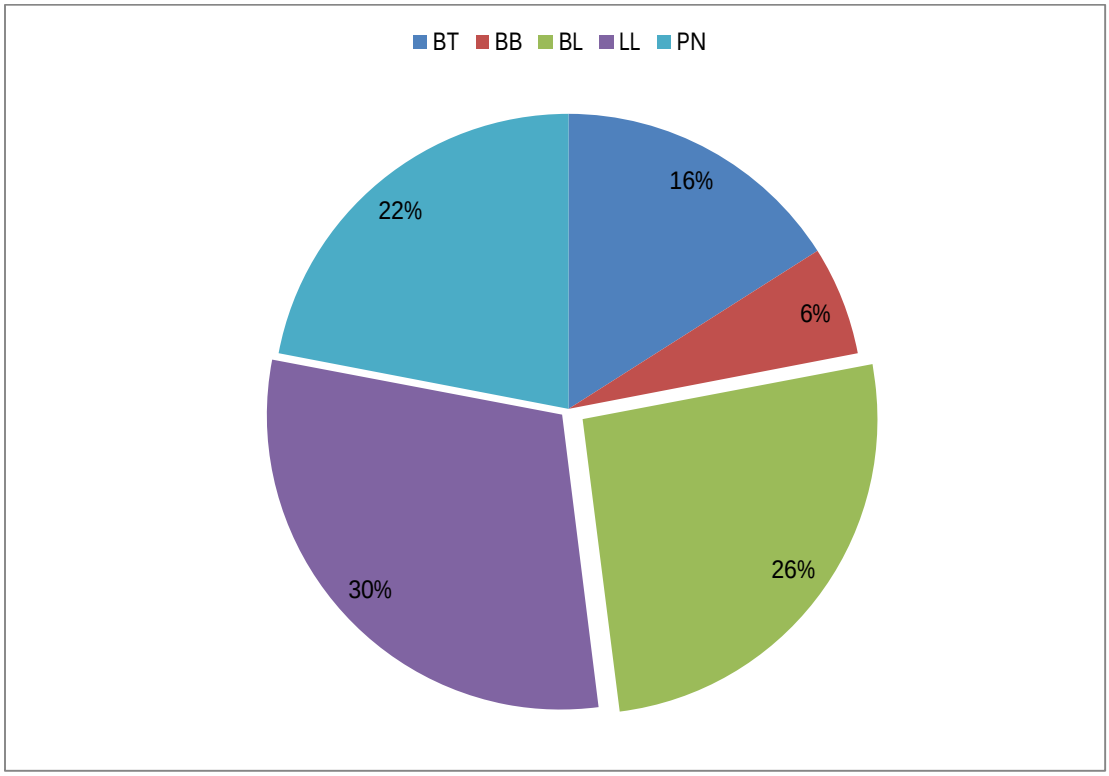
SPECTRUM OF THE DISEASE IN PATIENTS WITH DEFORMITIES

The deformities were common in lepromatous leprosy patients with total of 15(30%) followed by borderline lepromatous with total of 13(26%)

Table 8: Spectrum of the disease in patients with deformities

Spectrum of the disease	**No of patients with deformities**
Borderline tuberculoid (BT)	8
Borderline borderline (BB)	3
Borderline lepromatous(BL)	13
Lepromatous leprosy(LL)	15
Pureneruitic type(PN)	11

Figure 8 : Spectrum of the disease in patients with deformities



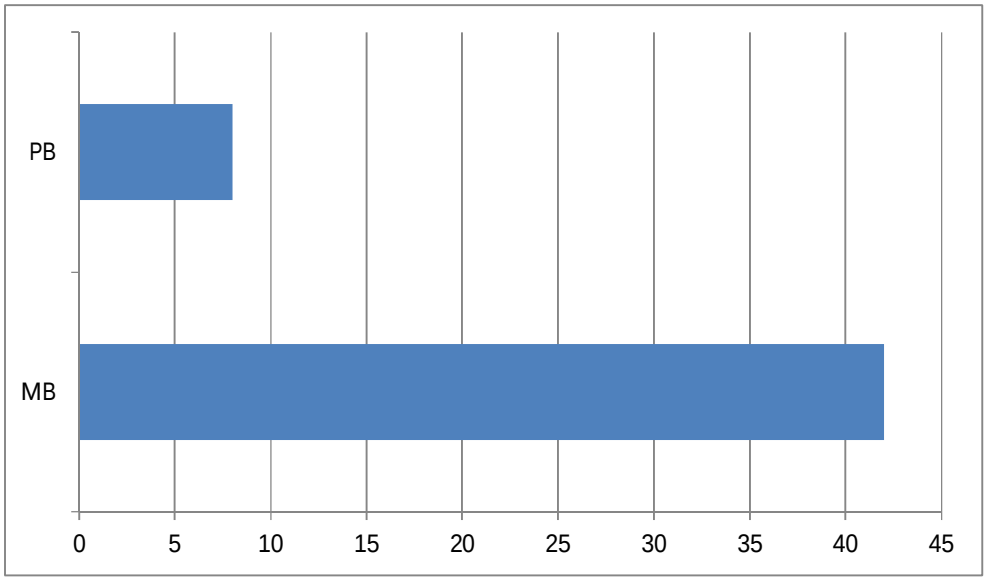
SPECTRUM OF THE DISEASE (WHO classification) IN PATIENTS WITH DEFORMITIES

Deformities were common in multibacillary patients with total of 42(86%) and 8 patients with paucibacillary patients had deformities .

Table 9 :

WHO classification MB/PB	**No of patients**
Multibacillary	42
Paucibacillary	8
total	50

Figure 9 :



DISABILITY AND DEFORMITY INDEX

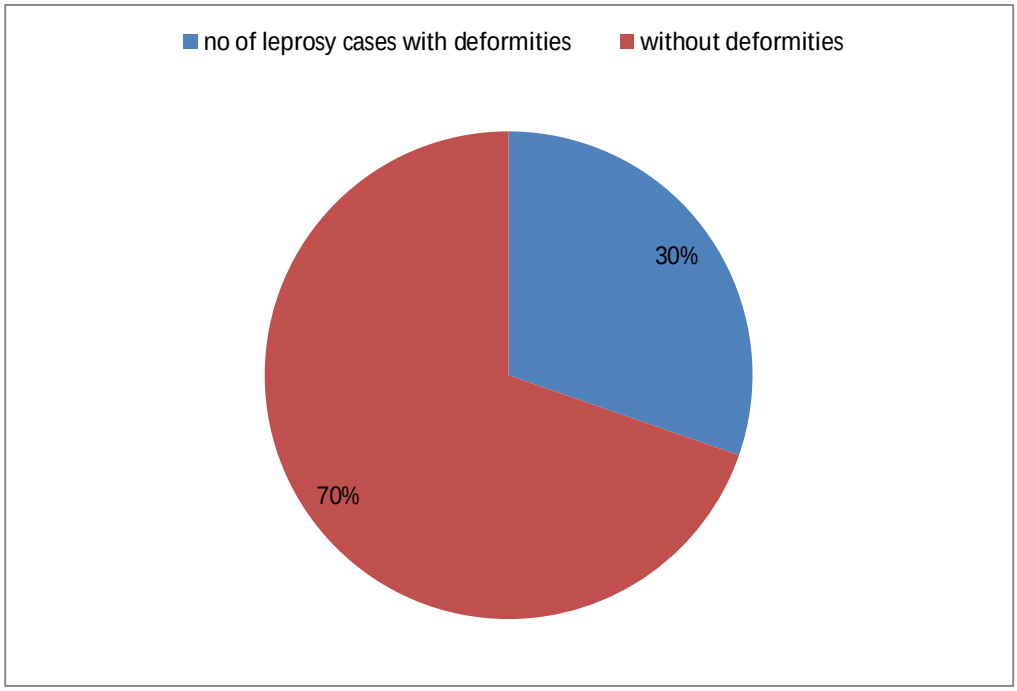
Out of 165 new leprosy patients , 50 patients were found to have deformities. According to my study, disability and deformity index is 30.3% .

Table :10

No of leprosy cases with deformities	50
No of leprosy cases without deformities	115
Total leprosy cases	165

Figure : 10

Disability and deformity index



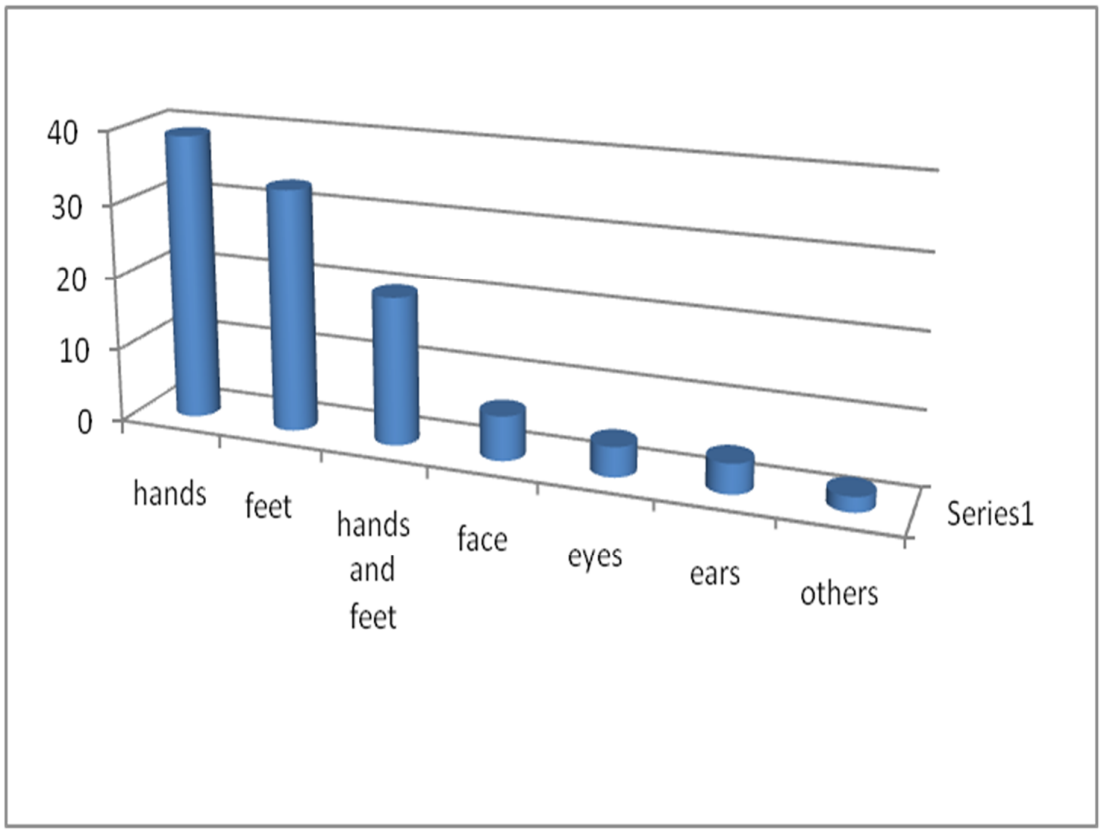
DEFORMITIES INVOLVING THE VARIOUS PARTS OF THE BODY

Deformities were more commonly found in the hands with total of 39 patients followed by both hand and feet .It was followed by feet , face and eyes.

Table : 10

deformities	No of patients
Hands	39
Hands and feet	33
feet	20
Eyes	4
Ears	4
Face	6
others	2

Figure :10


40
30
20
10
0
hands
feet
hands and feet
face
eyes
ears
others
Series1

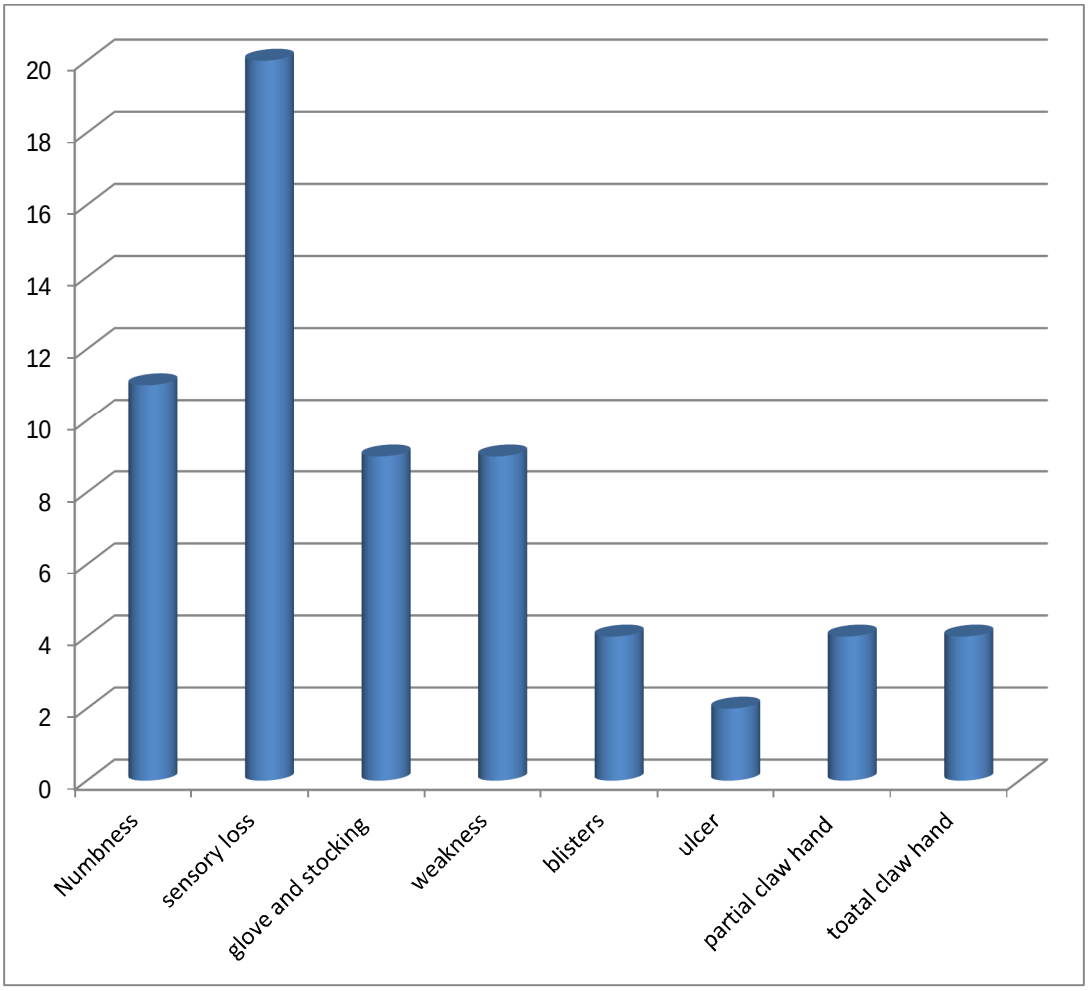
HAND DEFORMITIES

In case of hand deformities , sensory loss was found to be common with total of 20 patients followed by numbness and weakness of hands in 11 and 9 patients respectively .

Table : 11

manifestations	**No of patients**
Numbness	11
Sensory loss	20
Glove and stocking	9
Weakness	9
Blisters	4
Ulcer	2
Partial claw hand	4
Claw hand	4

Figure :11


20
18
16
14
12
10
8
6
4
2
0
Numbness
sensory loss
glove and stocking
weakness
blisters
ulcer
partial claw hand
toatal claw hand

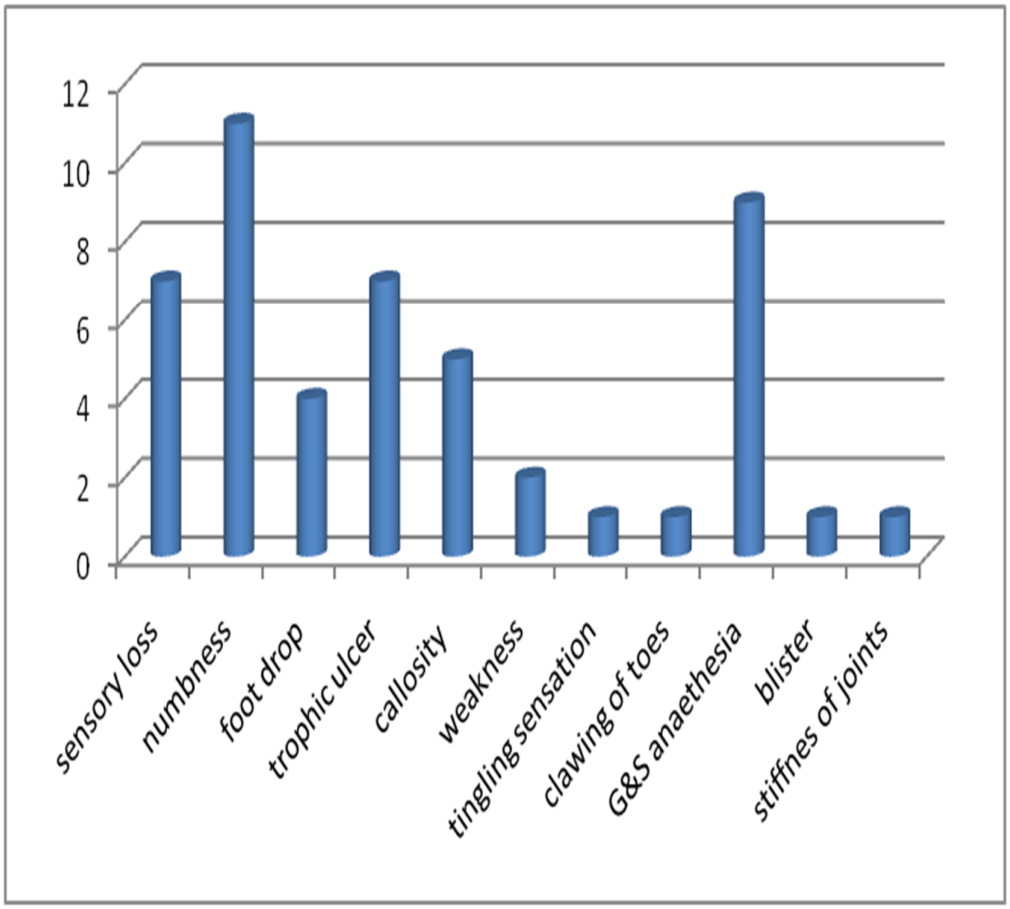
MANIFESTATIONS OF FOOT DEFORMITIES

In case of foot deformities , numbness (paraesthesia) was found to be common with a total of 11 patients and followed by glove and stocking type of anesthesia in 9 patients

Table : 12

Manifestations of foot deformities	**No of patients**
Foot drop	4
Sensory loss	7
Numbness	11
Trophic ulcer	7
Callosity	5
Blister	1
weakness	1
Tingling sensation	1
Clawing of toes	1
Stiffness of joints	1
Glove and stocking type of anaethesia	9

Figure :12 foot deformities



TYPES OF DEFORMITIES

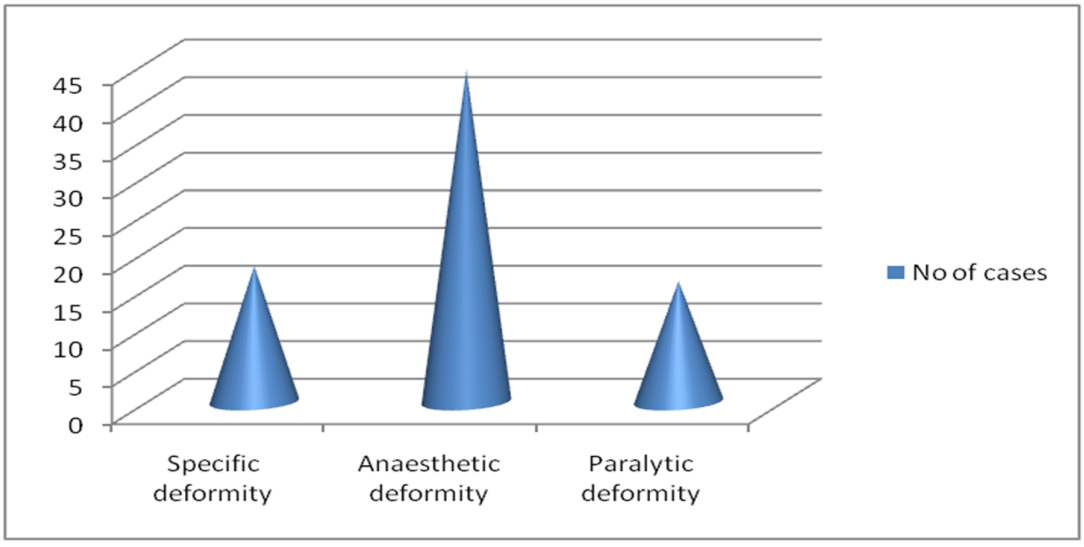
Anaesthetic type of deformities were found to be common with total of 44(88) cases followed by specific deformities with 18(36%) cases.

The least deformity was paralytic deformity with total of 16(32%) cases.

Table :13

Type of the deformities	No of cases
Specific deformity	18
Anaesthetic deformity	44
Paralytic deformity	16

Figure : 13



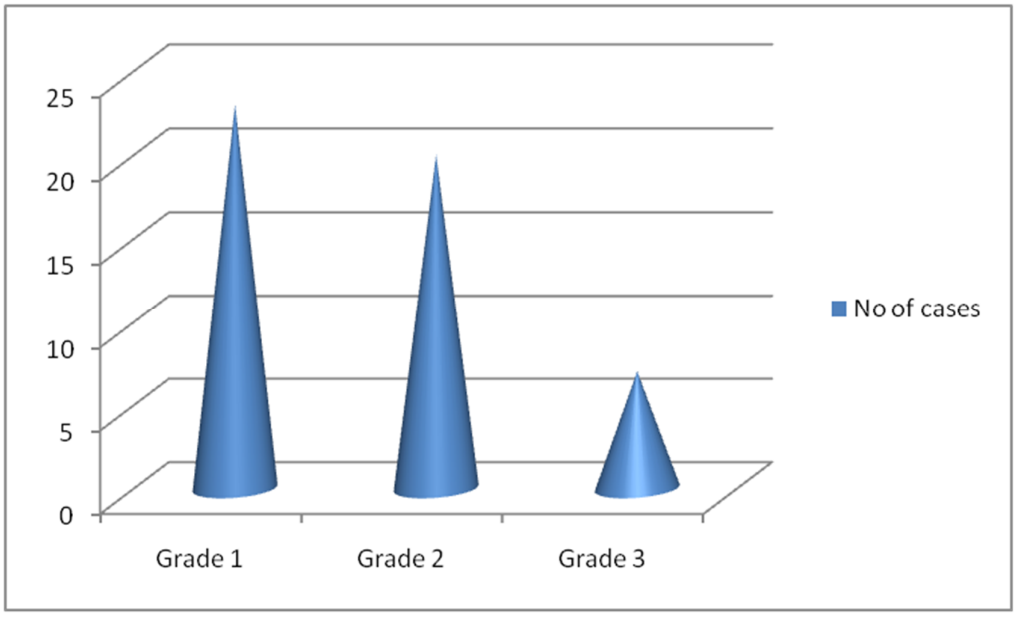
WHO 1970 -Grading of the deformities (Hands feet eyes)

Grade 1 deformities were more common with total of 23(46%) cases followed by grade 2 in 20(40%) cases.

Table :14

Type of grading	No of cases
Grade 1	23
Grade 2	20
Grade 3	7
Total no of cases	50

Figure :14



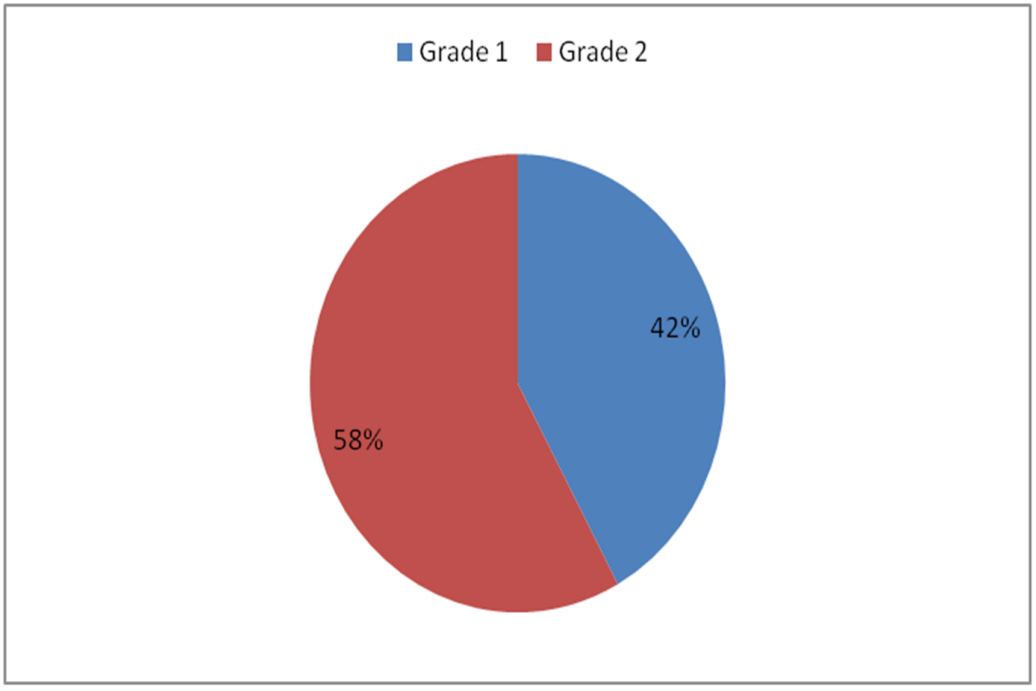
WHO(1988) Grading of deformities(hands feet eyes)

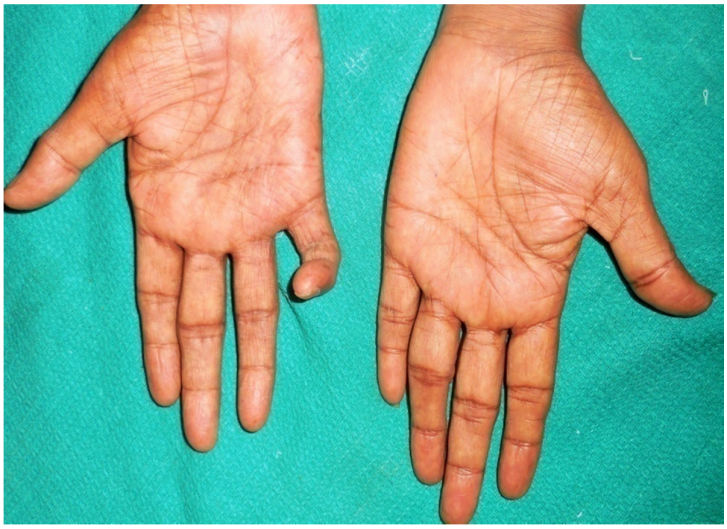
Grade 2 deformities were more common than grade 1 deformities.

Table :15

Type of deformity	No of cases
Grade 1	21
Grade 2	29

Figure :15

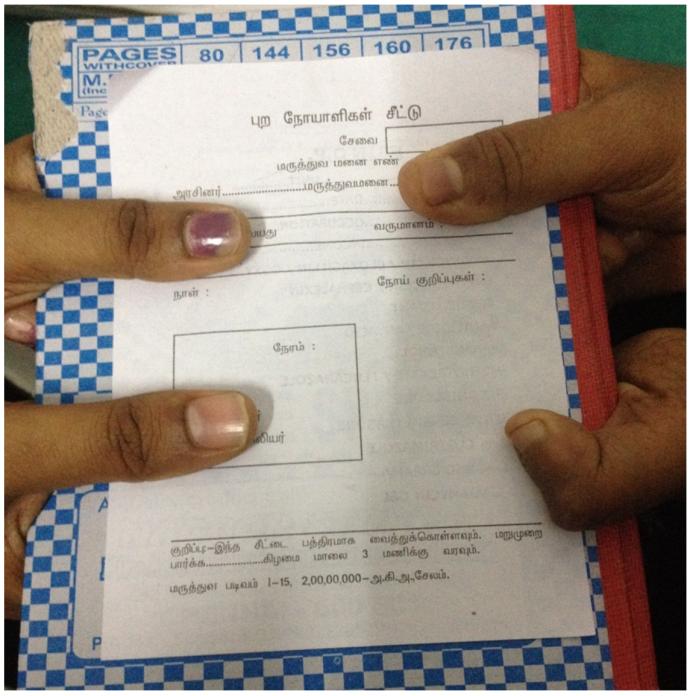




Picture 1: partial claw hand

Picture 2 : Partial claw hand with guttering of dorsal interrosseus spaces

Picture 3 : total claw hand



Picture 4 : froment' sign positive (adductor pollicis weakness)

Picture 5 : hypopigmented patch with partial claw hand

Picture 6: Weakness of dorsal interossei

(inability to adduct the little finger)

Picture 7 and 8 : wasting of thenar and hypothenar muscles and partial claw hand

Picture 9: partial claw hand and guttering of interossei spaces

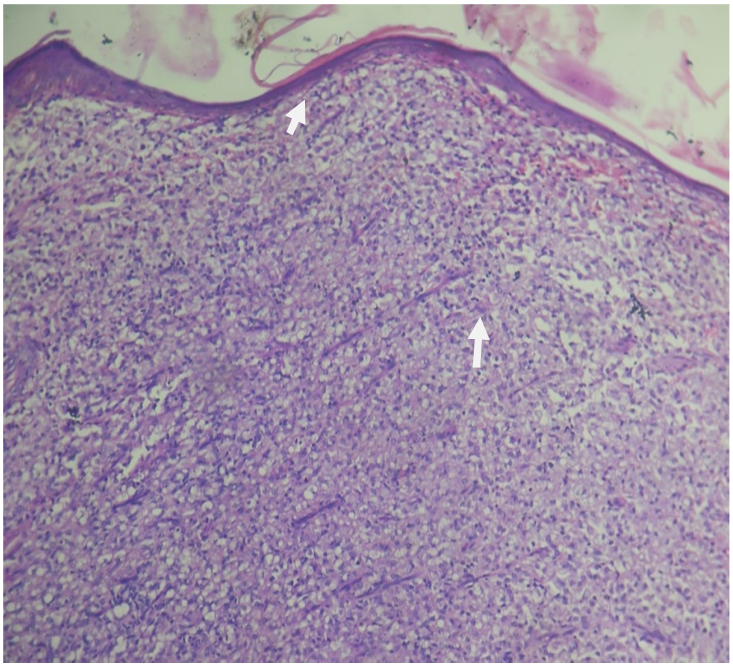
Picture 10 :wasting of thenar and hypothenar

muscles of the both hands

Picture 11 :hypopigmented patch with facial nerve weakness

Picture 12 : Hypopigmented patch with madarosis

Picture 13 : Borderline lepromatous leprosy - hypopigmented patch with Coppery hue



Picture 14 : HPE of lepromatous leprosy - Thinning of epidermis ,Dermis full of foamy macrophages

Picture 15 : Ear lobe infiltration

Picture 16 : budha ear

Picture 17 : ear lobe infiltration

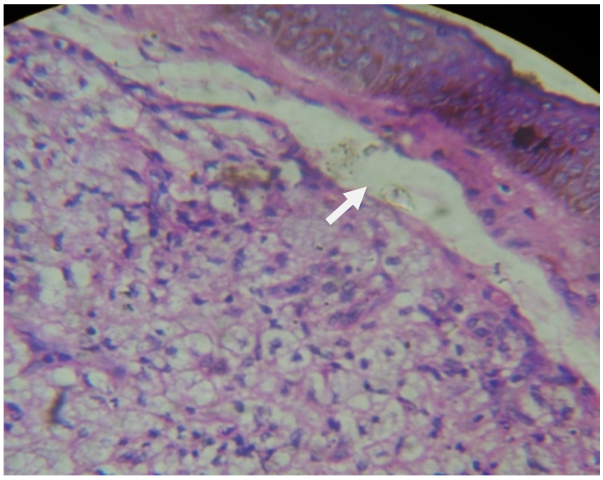
Picture 18 : trophic ulcer

Picture 19 : callosities

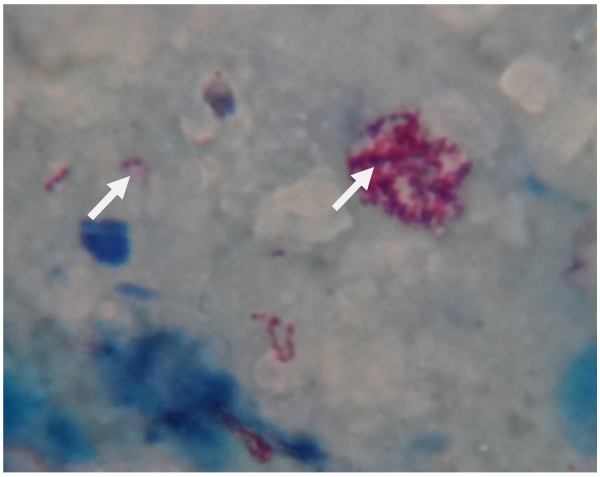
Picture 20: trophic ulcer with clawing of great toe

picture 21 :hypopigmented patch with healing blister over the anesthetic areas.

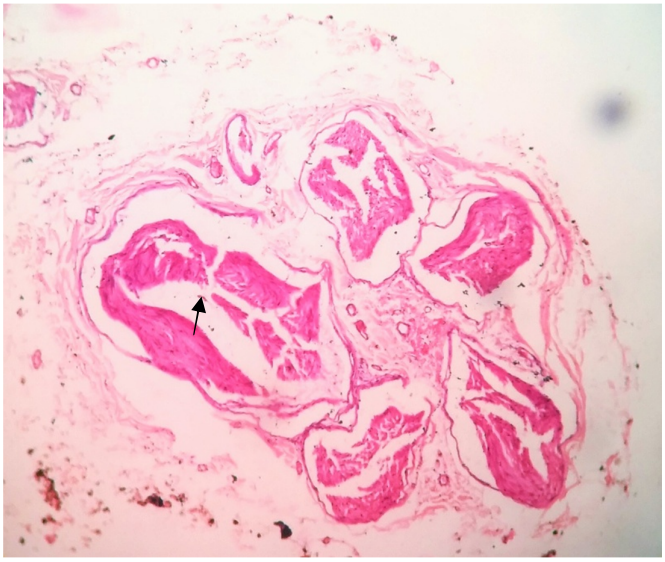
Picture 22 : blisters and scars over the anaesthetic areas of the both thumb



Picture 24 : HPE of lepromatous leprosy : Epidermis-thin. Grenz zone (+).Dermis : granuloma with foamy macrophages.

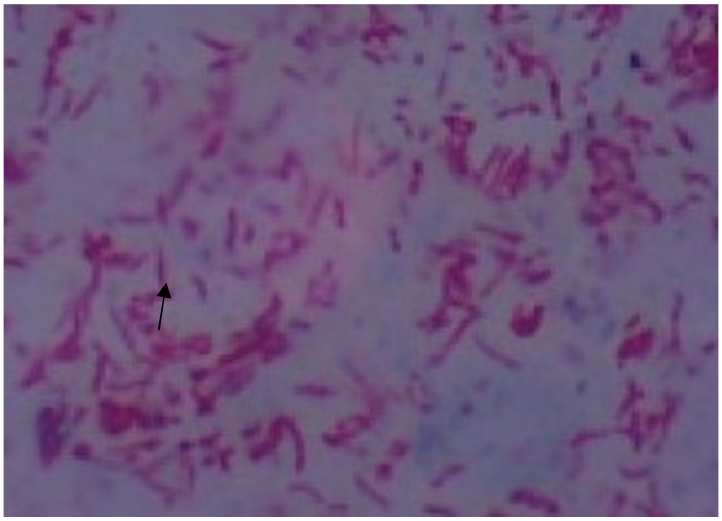


picture25: Fite faraco - plenty of pink solid and fragmented bacilli



Picture 26 : Fite faraco staining - plenty of pink solid and fragmented bacilli

Picture 27: food drop



Picture 28 : slit skin smear – AFB 3+

Discussion

DISCUSSION

The purpose of the study was to determine the frequency and the severity of the deformities and to study about the sociodemographic factors associated with deformities

DISABILITY AND DEFORMITY INDEX

In this study ,out of 165 newly diagnosed leprosy patients,deformities were notified in 50 cases, making the disability and deformity index of 30.3% which is similar to study conducted by nagabhushnam [62], WHO expert committee[69], Jodhpur[65]

This is contrast to the study conducted by marie adeladie leprosy centre, Karachi in 2002 and farooq in lankana region[62].

DEMOGRAPHIC CHARACTERS

SEX

Out of these 50 patients, deformities were common among males with 35(70%) patients while females were 15(30%).

Thus deformities were more common in males with male:female ratio as 7:3. It is very similar to studies conducted by Singai, Pakistan and Saha, Kolkata [65]with male preponderance.

AGE

The most common age group involved in our study in patients with deformities were 41-50 years(30%) which was similar to a study conducted by Singai,Pakistan[65] .

It was closely followed by 21-30 years age group with 11 (22%) patients and 31 – 40 years age group with 10 cases (20%)

Maximum number of affected males were in the age group of 31-40 years with total of 9(18%) and 21-30 years with 9 (18%) followed by 41-50 years with total of 7(14%) males and 51 to 60 years with 4(8%) males

Females were affected more in the age group of 41 to 50 years with a total of 8 (16%) women in this age group, followed by 51 to 60 years group with 3 (6%)patients which is similar to the studies conducted by singai ,pakistan [65]and Nauru assam[82].

SOCIOECONAMIC STATUS

The study participants in our study were most of them belonged to lower lower class with 21(42%)cases followed by lower middle group with 14 (28%)cases.

OCCUPATION

The study participants in our study were most of them who belonged to manual labour occupation with 12 patients(24%), followed by housewives with 8 patients, farmer with 7 patients,student with 4 patients, mazon with 3 patients. Manual labour was more common occupation in case of males and housewives in case of females which is similar to studies conducted by Kalla et al in jodhpur[65] ,and Withington[82]

MEDICAL CARE AVAILABILITY

In my study , medical care was not available in 33(66%) cases with deformities at their own places.

DURATION OF THE DISEASE

The duration of the disease also affected the disability rate ,being highest in the disease with duration of more than 2 years(46%) followed by 5 years(30%). Deformities were lowest in 0-2 years duration group(24%).

It was similar to studies conducted by selvaraj[65] , Thiruvannamalai

SPECTRUM OF THE DISEASE

The deformities were noted commonly in lepromatous leprosy patients with total of 15(30%) followed by borderline lepromatous with total of 13(26%),pure neuritic type of leprosy with 11 patients (22%) .

Patients with least common deformities were borderline tuberculoid type of leprosy.This was similar to studies conducted by Jhuma sarkar[82] and Singai,Pakistan[65]

In our study multibacillary patients had more deformities(84%) when compared to paucibacillary patients (16%) which is similar to studies conducted by Schreuder and De Oliviera[82]

TYPE OF DEFORMITIES

Anaesthetic type of deformities were commonly notified with total of 44 cases (88%) followed by specific deformities with 18 cases (36%),paralytic deformities with 16cases (32%).It was similar to the studies conducted by selvaraj [65] , thiruvannamalai and Saha[65] , Kolkatta.

Anaesthetic type of deformities were highest in lepromatous type of leprosy and paralytic type of deformities were highest in pureneuritc type of Hansen(40%) .It was similar to study conducted by kumar et al[82].

GRADING OF DEFORMITIES

Grade 1 deformities were common with total of 23 patients (46%) which is followed by type 2 deformities with 20 patients (40%)

The least being deformity was grade 3 deformity with 7 patients (14%) which is similar to the findings as shown by Sharma , Selvaraj and Saha[65]

Hands were most commonly involved in case of deformities with total of 39 patients (78%) followed by both hands and feet with 33 patients (66 %), feet with 20 patients(40%).

Face , eyes and ears were least being involved which was very similar to the studies conducted by Jhuma Sarkar[82], Farooq[69]

Sensory loss(40%) was more commonly noted followed by numbness (22%)in case of anaethetic deformities involving the hand.Weakness (18%)was most common paralytic deformity noted in case of hand deformities .It was similar to the studies conducted by Jhuma Sarkar[82] and Nagapushnam[62]

Numbness(22%) followed by glove and stocking type of anesthesia(18%) were commonly noted anesthetic deformity involving

the foot.Foot drop(8%)was most common paralytic deformity similar to the study by Jhuma Sarkar [82]and noorhudhin[56]

Madarosis(8%) was the most common deformity in case of eyes which is similar to the study conducted by farooq et all[69]

Summary

SUMMARY

Out of the 165 newly diagnosed leprosy patients 55 patients had deformities, thus making the disability and deformity index to be **30.3%**

- ✓ Males were more commonly affected with deformities than females. Males with a total of 35 patients (70%) and females with a total of 15 patients (30%)
- ✓ Male and female ratio – 7:3
- ✓ Age group of 41-50 years were more commonly affected with deformities with a total of 15 patients(30%) followed by 21-30 years age group with a total of 11 patients (22%)
- ✓ Males with age group of 21-40 years were commonly affected with a total of 18 patients(36%) followed by 41-50 years with a total of 7 patients (14%)
- ✓ Females with the age group of 41-50 years with a total of 8 patients (16%) followed by 51-60 years with atotal of 3 patients (6%)
- ✓ Deformities were more common in the lower lower class with a total of 21 (42%) followed by 14 (28%) patients.

- ✓ Manual labourers(24%) were more commonly affected occupation with deformities followed by housewives with total of 8 patients (16%)
- ✓ Manual labourers and housewives were commonly affected occupation in case of males and females respectively
- ✓ Medical care was not available in case of 33(66%) patients with deformities
- ✓ Leprosy disease with duration of 2-5 years(46%) were more commonly affected with deformities followed by more than 5 years (30%)
- ✓ Lepromatous type of leprosy patients were more commonly affected with a total of 15 patients (30%) followed by borderline lepromatous type of leprosy with a toal of 13 patients.
- ✓ Anaesthetic type of deformities(44 patients) were common followed by specific deformities(18 patients) and paralytic deformities(16 patients)
- ✓ Grade I deformities were most common with a total of 23 patients (46%) followed by grade 2 deformities with a total of 20 patients (40%).The least common deformity was grade 3 deformities.
- ✓ Hand deformities were common with a total of 39(78%) patients followed by hands and feet with a total of 33 patients (66%)

- ✓ Sensory loss(40%) was the most common anesthetic deformity in case of hands.Weakness(18%)was the most common paralytic deformity in case of hands.
- ✓ Numbness(22%) was the most common anesthetic deformity and foot drop (8%)was the most common paralytic deformity in case of foot.
- ✓ Madarosis(8%) were commonest manifestation in case of eyes

Conclusion

CONCLUSION

1. The deformities in the leprosy are the most striking manifestation.It may range from mild degree such as sensory loss over the hands to the very severe degree as complete claw hand and resorption of fingers.
2. Highlighting the importance of health education to the patients and their family to prevent the formation and worsening of deformities.
3. In our study, out of 165 new leprosy patients, 50 patients had deformities , making the disability and deformity index to be 30.3%.
4. Males with 41-50 years age group and manual labourers were most commonly affected with deformity .
5. Lepromatous type of leprosy with duration more than 2 years were notified to have the higher deformities.So, early diagnosis and treatment prevents the deformities.
6. In case of pureneuritc type of leprosy, paralytic deformities were more common.
7. Multibacillary leprosy cases were having higher deformities than paucibacillary patients
8. Anaesthetic deformities were noted commonly followed by specific deformities in case of hands and feet.

9. Hand deformities were most common. Sensory loss was the most common manifestation in both hand and feet deformities.
10. Grade 1deformities were the most common followed by grade 2 deformities. Grade 3 deformities were least common.

So, health education plays the important role to prevent the formation and progression of deformities. Every patient with the leprosy should be taught proper health education to prevent the worsening the deformities. The patient should be properly referred to specialists whenever required.

This disabilities in patients with leprosy result in biomedical and psychosocial consequences. Early diagnosis ,proper MB-MDT therapy, health education, rehabilitation are the process of preventing this phenomenon which enables one to repossess the one's role and functions in society.

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Annexures

ABBREVIATIONS

1.	LL	-	Lepromatous leprosy
2.	BL	-	Borderline lepromatous leprosy
3.	BB	-	Borderline borderline type
4.	BT	-	Borderline tuberculoid type
5.	TT	-	Tuberculoid type
6.	PN	-	Pure neuritc type
7.	FDP	-	Flexor digitorum profoundus
8.	FCU	-	Flexor carpi ulnaris
9.	ABP	-	Abductor pollicis brevis
10.	EHL	-	Extensor hallucis longus
11.	PL	-	Peroneus longus
12.	FDS	-	Flexor digitorum superficilalis
13.	ABP	-	Abductor pollicis brevis

MASTER CHART

Sr.no	sex	age	SocioEconomical status	Occupation	Medical care availability	Duration	Spectrum of the disease	Paucibacillary/ multibacillary	Deformities hands	feet	eyes	face	ears	others	Primary deformity	Secondary deformity	Specific deformity	Anesthetic deformity	Paralytic deformity	WHO Grading 1970	WHO Grading 1988
1.	F	15	um	me	av	1y	BT	PB	num	ab	ab	ab	ab	ab	pre	ab	Ab	pre	ab	I	I
2.	F	47	ul	fa	Nv	3y	PN	MB	Ch	fd	ab	ab	ab	ab	Pre	Ab	Ab	ab	pre	III	II
3.	M	39	Ll	ma	Nv	4y	LL	MB	num	num	ab	ab	be	ab	pre	ab	Pre	Pre	ab	I	II
4.	M	35	Lm	ml	Nv	3y	PN	MB	Sl Pcl,Bls	ab	ab	ab	ab	ab	pre	pre	Ab	pre	pre	II	II
5.	M	30	ul	el	Av	1y	BL	MB	Sl	Ab	ma	ab	ab	ab	pre	ab	pre	pre	ab	I	I
6.	F	42	Ll	ar	Nv	6y	LL	MB	num	num	ab	tf	eli	ab	pre	ab	pre	pre	ab	I	II
7.	M	71	Ll	fa	Nv	6y	bl	MB	Sl Was pch	Ab	ab	ab	ab	ab	pre	ab	ab	pre	pre	II	II
8.	F	42	ul	hw	Av	1y	BT	PB	Num	ab	ab	ab	ab	ab	pre	pre	ab	pre	ab	I	I
9.	M	65	Ll	ml	Nv	6y	LL	MB	G&S Was,WkCh, tro	ab	ab	ab	ab	gy	pre	Pre	Pre	pre	pre	III	II
10.	M	24	um	st	Nv	6y	PN	MB	Ab	Sl Tro cal	ab	ab	ab	ab	pre	pre	ab	pre	Ab	II	II
11.	M	43	ul	fa	Av	3y	BB	MB	Sl pch	ab	ab	ab	ab	ab	pre	ab	ab	pre	pre	II	II
12.	M	29	Ll	ml	Nv	7y	LL	MB	g&s was,wk	Fd, wk cal bls	ab	ab	ab	ab	pre	pre	pre	pre	pre	III	II
13.	M	55	lm	ml	Av	4y	LL	MB	Num Bls	ab	ab	ab	ab	ab	pre	pre	ab	pre	ab	II	II
14.	M	42	ul	st	Nv	1y	BT	PB	ab	num	ab	ab	ab	ab	pre	ab	ab	pre	ab	I	I
15.	F	46	lm	ml	Nv	1y	PN	MB	Sl	Sl, Tro	ab	ab	ab	ab	pre	pre	ab	pre	ab	II	II
16.	M	62	ul	el	Av	4y	BL	MB	num	tin	ab	ab	ab	ab	pre	ab	pre	pre	ab	I	I

Sr.no	sex	age	SocioEconomical status	Occupation	Medical care availability	Duration	Spectrum of the disease	Paucibacillary/ multibacillary	Deformities hands	feet	eyes	face	ears	others	Primary deformity	Secondary deformity	Specific deformity	Anesthetic deformity	Paralytic deformity	WHO Grading 1970	WHO Grading 1988
17.	M	60	Ll	fa	Nv	7y	LL	MB	ab	Num tro	ma	ab	ab	ab	pre	pre	pre	pre	ab	II	II
18	M	64	um	ml	Nv	1y	PN	PB	Sl,ulc	ab	ab	ab	ab	ab	pre	Pre	ab	pre	ab	II	II
19	M	20	ul	me	Nv	5y	BT	MB	Sl,Wk	ab	ab	ab	ab	ab	pre	ab	ab	pre	pre	II	II
20.	F	42	Ll	hw	Nv	8y	BL	MB	Sl Wk,was	ab	ab	ab	ab	ab	pre	ab	ab	pre	pre	II	II
21.	M	32	lm	St	Av	6y	BT	PB	Sl	ab	ab	ab	ab	ab	pre	ab	ab	Pre	ab	I	I
22.	M	38	ul	ml	Av	6 m	LL	MB	Sl	num	ab	ab	ab	ab	pre	pre	ab	pre	ab	I	I
23.	M	54	Ll	st	Nv	4y	PN	MB	ab	Fd	ab	ab	ab	ab	pre	ab	ab	ab	pre	III	II
24.	F	48	Ll	ml	Av	3y	BB	MB	Sl,ulc Bls	num	ab	ab	ab	ab	pre	Pre	ab	pre	ab	II	II
25.	F	44	um	hw	Nv	7y	BL	MB	ab	num	ab	ab	ab	ab	pre	ab	ab	pre	ab	I	I
26.	M	60	ul	ml	Nv	3y	PN	MB	Sl Wk ,ch	Cal Tro	Lag ma	fp	ab	ab	pre	pre	Pre	pre	pre	III	II
27.	M	23	ul	of	Av	6y	BT	PB	num	ab	ab	ab	ab	ab	pre	ab	ab	pre	ab	I	I
28	F	17	Ll	hw	Nv	4y	BL	MB	Sl	ab	ab	ab	ab	ab	pre	ab	ab	pre	ab	I	I
29	F	32	lm	fa	Nv	4y	PN	MB	ab	Sl,Tro, Clt	ab	ab	ab	ab	pre	pre	ab	pre	pre	II	II
30	M	48	ul	fa	Nv	3y	LL	MB	G&S Was,Wk	stj Tro	ab	sag	ab	ab	pre	pre	Pre	ab	pre	III	II
31	M	35	lm	hw	Av	5y	BL	MB	ab	Num sl	ab	ab	ab	ab	pre	ab	ab	pre	ab	I	I
32	F	23	ul	ml	Nv	3y	BL	MB	G&S Bls	Num	ab	ab	ab	ab	pre	pre	pre	ab	ab	II	II
33	M	35	Ll	ma	Av	1y	BT	PB	Num	ab	ab	ab	ab	ab	pre	ab	ab	pre	ab	I	I
34	M	30	um	ta	Nv	4y	BL	MB	ab	Num	ab	ab	eli	ab	pre	ab	Pre	pre	ab	I	I
35	M	26	ul	ta	Nv	4y	LL	MB	G&S	Num	ab	ab	ab	ab	pre	ab	Pre	pre	ab	I	I
36.	M	24	Ll	fa	Nv	4y	PN	MB	ab	Sl,Tro	ab	ab	ab	ab	pre	pre	ab	pre	ab	II	II
37.	M	28	lm	go	Nv	6y	BL	MB	Sl Wk,was	Sl Wk	ab	fp	ab	ab	pre	ab	ab	pre	pre	II	II
38	M	42	ul	pa	Av	3y	LL	MB	Sl	ab	ab	ab	Eli	ab	Pre	ab	Pre	Pre	ab	I	I

Sr.no	sex	age	SocioEconomical status	Occupation	Medical care availability	Duration	Spectrum of the disease	Paucibacillary/ multibacillary	Deformities hands	feet	eyes	face	ears	others	Primary deformity	Secondary deformity	Specific deformity	Anesthetic deformity	Paralytic deformity	WHO Grading 1970	WHO Grading 1988
39.	M	24	Ll	dv	Nv	4y	BL	MB	Num Sl,bls	ab	ab	ab	ab	ab	pre	Pre	ab	pre	ab	II	II
40.	F	52	Ll	hw	Av	6y	PN	MB	ab	Tin,Sl	ab	ab	ab	ab	pre	ab	ab	pre	ab	I	I
41.	M	46	Ll	fa	Nv	6y	LL	MB	Sl Was,Wk	Fd Cal	ma Lag bv	fp	ab	ab	pre	pre	Pre	pre	pre	III	II
42.	M	10	Ll	ma	Av	1y	LL	MB	Sl	num	ab	ab	ab	ab	pre	ab	Pre	pre	ab	I	I
43.	M	32	um	ta	Nv	4y	BL	MB	ab	Bls, Ulc, cal	ab	ab	ab	ab	pre	Pre	ab	pre	ab	II	II
44.	M	35	Ll	cl	Nv	1y	BB	MB	ab	num	ab	ab	ab	ab	pre	ab	ab	pre	ab	I	I
45.	M	42	lm	ml	Nv	3y	PN	MB	Sl,bls Pch,was	ab	ab	ab	ab	gy	pre	pre	ab	pre	pre	II	II
46.	F	43	lm	pa	Av	1y	BT	PB	Num	ab	ab	ab	ab	ab	pre	ab	ab	pre	ab	I	I
47.	F	23	Ll	hw	Nv	6y	LL	MB	G&S, Sl Bls	Num	ab	ab	ab	ab	pre	pre	pre	pre	ab	II	II
48.	M	48	Ll	ml	Nv	3y	LL	MB	G&S	G&S	ab	ab	ab	ab	pre	ab	pre	ab	ab	I	I
49.	M	40	lm	dv	Nv	7y	LL	MB	PCH,wk was	G&S	ab	fp	ab	ab	Pre	ab	Pre	ab	Pre	II	II
50.	F	58	Ll	hw	Av	3y	BL	MB	num	ab	ab	ab	ab	ab	pre	ab	ab	pre	ab	I	I

KEY TO MASTER CHART

1.	M	- Male
2.	F	- Female
3.	UM	- Upper middle class
4.	UL	- Upper lower class
5.	LM	- Lower middle
6.	LL	- Lower lower
7.	Me	- Mechanic
8.	ma	- Mason
9.	ml	- Manual labourer
10.	fa	- Farmer
11.	el	- Electrician
12.	ar	- Artist
13.	dv	- Driver
14.	hw	- Housewife
15.	st	- Student
16.	of	- Office assistant
17.	go	- Goldsmith
18.	pa	- Painter
19.	ta	- Tailor
20.	cl	- Clerk
21.	LL	- Lepromatous leprosy
22.	BL	- Borderline lepromatous leprosy
23.	BB	- Borderline borderline type
24.	BT	- Borderline tuberculoid type
25.	TT	- Tuberculoid type
26.	PN	- Pure neuritc type
27.	MB	- Multibacillary
28.	PB	- Paucibacillary

29. G&S - Glove and stocking type of anesthesia
30. Wk - Weakness
31. was - Wasting of thenar and hypothenar muscles
32. pch - Partial claw hand
33. ch - Claw hand
34. sl - Sensory loss
35. num - Numbness
36. tin - Tingling sensation
37. tro - Trophic ulcer
38. ma - Madarosis
39. lag - Lagophthalmos
40. stj - Stiffness of joints
41. bls - Blisters
42. fd - Foot drop
43. els - Ear lobe infiltration
44. cal - Callosities
45. gy -gynaecomastia
46. pre - present
47. ab -Absent

PROFORMA

NAME:

AGE/SEX:

OP/IP No:

ENROLLMENT No:

PHONE:

ADDRESS:

INCOME:

SOCIOECONOMIC STATUS:

LITERACY:

Clinical examination:

H/o Presenting illness:

Onset:

Progression:

	Present	Absent
Hypopigmented skin lesion		
Loss of sensation over the lesion		
Loss of sweating/loss of hair		
Pain/itching over the lesion		
Nasal stuffiness/epistaxis		
Pedal edema		

	Present	Absent
Tingling and numbness of hands and feet		
Spontaneous blisters over the hands and feet		
Spontaneous ulcers over the hands and feet		
Weakness of hands and feet		
Difficulty in combing the hair		
Difficulty in holding the chappals		
Watering of eyes and photophobia		
Inability to close the eyelid		
Hand/Foot deformity		

PAST HISTORY:

Co-morbid medical illness:

If so what :

FAMILY HISTORY :

CONTACT HISTORY :

EXPOSURE HISTORY :

GENERAL EXAMINATION :

Face: nodules/skin thickening

Nasal deformity:

Ear lobe infiltration:

Gynaecomastia/yesticular arotphy:

Oral mucosa

DERMATOLOGICAL EXAMINATION:

Skin lesion:

Number and site

Size

Symmetry

Edges

Borders

Surface : smooth / dry / scaly / erythematous / necrosis

Induration

Sensation

Loss of hair

Loss of sweating

Satellite lesions

Nerve twigs

Sensory system :

Touch

Pain

Temperature

Motor System: UL LL

power

movements

Peripheral nerve examination :

Nerve	Right		Left	
	Thickening	Tenderness	Thickening	Tenderness
Supra-orbital N.				
Infra-orbital N.				
Greater Auricular N.				
Clavicular Ns.				
Radial N				
Ulnar N.				
Median N.				
Radial cutaneous N.				
Lateral Popliteal N.				
Sural N.				
Posterior Tibial N.				
Anterior Tibial N.				

Tests

Oshner clasping test

Pen test

Book test

Card test

Egawa test

Right Left

HAND

Anaesthesia

Claw hands

Resorption of fingers

Z thumb

Frozen hand

Contractures

Ulceration

Wrist drop

FEET

Anaethesia

Claw toes

Resorption of toes

Ulceration

Foot drop

EYES

Madarosis

Blurring of vision

Lagopthalmos

Marked loss of vision

Blindness.

CLINICAL DIAGNOSIS:

Investigations:

CBC:	RFT:	LFT:
SSS:	Skin biopsy:	Nerve biopsy:
Nerve conduction studies		Specialist's opinion

INFORMATION SHEET

TITLE :**"CLINICAL STUDY OF DEFORMITIES IN NEWLY DIAGNOSED LEPROSY PATIENTS "**

Name of Investigator :Dr.H.Dhanaselvi Name of Participant :

Purpose of Research : The purpose of the study is to find out the frequency and severity of deformities among newly diagnosed leprosy patients.

Study Design : Observational Study

Study Procedures : Patient will be subjected to routine blood investigations, slit skin smear.If needed we will obtain small piece of skin and nerve [biopsy] for confirmation of diagnosis.Patient will be subjected to Xray, orthopaedic, opthalmological,neurological evaluation in selected cases.

Possible Risks : No risks to the patient

Possible benefits

To patient : Health education can be provided to the patient regarding rehabilitation for the deformities and to lessen the worsening of deformities.

To doctor & to other people : This study will give the deformity and disability rates among the newly diagnosed leprosy patients along with association of clinical and sociodemographic factors. Health

education can be provided to the patient's family and relatives regarding Multi Drug therapy and rehabilitation .

Confidentiality of the information obtained from you : The privacy of the patients in the research will be maintained throughout the study. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared.

Can you decide to stop participating in the study : Taking part in this study is voluntary. You are free to decide whether to participate in this study or to withdraw at any time

How will your decision to not participate in the study affect you : Your decision will not result in any loss of benefits to which you are otherwise entitled.

Signature of Investigator Signature of Participant

Date :

Place :

PATIENT CONSENT FORM

Study Detail	:	**"Clinical study of deformities in newly diagnosed leprosy patients "**
Study Centre	:	Rajiv Gandhi Government General Hospital, Chennai.
Patient's Name	:	
Patient's Age	:	
In Patient Number	:	

Patient may check (☑) these boxes

- I confirm that I have understood the purpose of procedure for the above study. I have the opportunity to ask question and all my questions and doubts have been answered to my complete satisfaction. ❑
- I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving reason, without my legal rights being affected. ❑
- I understand that sponsor of the clinical study, others working on the sponsor's behalf, the ethical committee and the regulatory authorities will not need my permission to look at my health records, both in respect of current study and any further research that may be conducted in relation to it, even if I withdraw from the study I agree to this access. However, I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from this study. ❑
- I agree to take part in the above study and to comply with the instructions given during the study and faithfully cooperate with the study team and to immediately inform the study staff if I suffer from any deterioration in my health or well being or any unexpected or unusual symptoms. ❑
- I hereby consent to participate in this study ❑
- I hereby give permission to undergo complete clinical examination, routine blood investigations, slit skin smear, skin and nerve biopsy, nerve conduction studies, orthopaedic, ophthalmological, neurological, evaluation ❑

Signature/thumb impression
Patient's Name and Address:

Signature of Investigator
Study Investigator's Name:
Dr.H.DHANASELVI.

ஆராய்ச்சியில் பங்கேற்பவர்க்கான தகவல் அறிக்கை

ஆராய்ச்சியின் தலைப்பு : "புதியதாக கண்டறியப்படுகின்ற தொழுநோயாளிகளுக்கு ஏற்படும் குறைபாடுகளின் தீவிரத்தை அறிவதற்கான ஆய்வு"

ஆராய்ச்சி செய்பவரின் பெயர் : மருத்துவர் அ. தனச்செல்வி

பங்கேற்பாளரின்பெயர் :

வயது: பால் : தேதி :

ஆராய்ச்சிசேர்க்கைஎண்: உள்நோயாளிஎண் :

இந்தஆராய்ச்சி / ஆய்வு /செய்முறை /சோதனையில் தாங்கள் பங்கேற்க அழைக்கிறோம். இந்ததகவல் அறிக்கையில் கூறப்பட்டிருக்கும் தகவல்கள் தாங்கள் இந்த ஆராய்ச்சியில் பங்கேற்கலாமா அல்லது வேண்டாமா என்பதை முடிவு செய்ய உதவியாக இருக்கும். இந்த படிவத்தில் உள்ள தகவல்கள் பற்றி உள்ள சந்தேகங்களை நீங்கள் தயங்காமல் கேட்கலாம்.

இந்த ஆய்வின் நோக்கம் என்ன ?

புதியதாக கண்டறியப்படுகின்ற தொழுநோயாளிகளுக்கு ஏற்படும் குறைபாடுகளின் தீவிரத்தை அறிதல் மற்றும் சுகாதார கல்வி மூலம் குறைபாடுகளின் தீவிரத்தை குறைத்தல்.

ஆய்வுமுறைகள் :

இந்த ஆராய்ச்சியில் தங்களுக்கு இரத்த பரிசோதனை செய்யப்படும். தேவைப்படுமெனில், தோல் மற்றும் நரம்பு திசு ஆய்வு, சிறப்பு நரம்பு பரிசோதனைகள் செய்து தொழுநோய்யை உறுதிப்படுத்துவது மட்டுமின்றி, குறைபாடுகளின் தீவிரத்தை அறிந்து சிறப்பு மருத்துவர்களின் ஆலோசனைகளைப் பெற்று அதற்கேற்றவாறு வைத்தியம் செய்யப்படும்.

ஆய்வினால்மக்களுக்குஏற்படும்நன்மைகள் :

இந்த ஆய்வின் முடிவில் கிடைக்கும் தகவல்கள் சமுதாயத்திற்கு பயனுள்ளதாகவும், எதிர்காலத்தில் நோயாளிகளுக்கு மருத்துவ தீர்வாகவும் அமையும்.

தங்களிடமிருந்து பெறப்படும் தகவல்களின் நம்பகத்தன்மை: தங்களிடமிருந்து பெறப்படும் தகவல்கள் பாதுகாக்கப்படும். அதற்கான முழு உரிமையும் தங்களுக்கு உண்டு.இந்த படிவத்தில் கையொப்பமிடுவதன் மூலம், தாங்கள் தங்களை பற்றிய விவரங்களையும், ஆய்வு விவரங்களையும், ஆராய்ச்சியாளர், ஆய்வு நடத்தும் ஏனையோர், வரைமுறை ஒழுங்கு குழுவினர் மற்றும் சட்டத்திற்கு உட்டபட்ட மருந்துகட்டுப்பாடு இயக்குனர் ஆகியோர் பார்வையிட அனுமதிக்கின்றீர்கள்.

இந்த ஆய்வில் காட்டப்படும் தகவல்கள் அறிவியல் நாளேடுகளிலோ அறிவியல் கூட்டங்களிலோ சமர்பிக்கப்படும்பட்சத்தில் தங்களது அடையாளம் வெளிப்படுத்தப்படமாட்டாது.

இந்த ஆய்வில் பங்கேற்காமல் இருப்பதினால் ஏற்படும் பாதிப்பு :

இந்த ஆய்வில் தாங்கள் பங்கேற்கவிருப்பம் தெரிவிக்காத நிலையில் தங்களின் மருத்துவரிடம் மற்றும் மருத்துவமனையில் தங்களுக்கு உள்ள உறவில் எந்த பாதிப்பும் ஏற்படாது. தாங்கள் எப்பொழுதும் சிறப்பாக கவனிக்கப்படுவீர்கள். மேலும் இதனால் தங்களுக்கு இழப்பு ஏதும் ஏற்படாது.

ஆய்வின் நடுவில் அதிலிருந்து விலகிக்கொள்ள நினைத்தால் :

இந்த ஆய்வில் பங்கேற்பது தங்களின் சொந்த விருப்பமே. மேலும் ஆய்வின் நடுவில் எந்த நேரத்திலும் எக்காரணமும் கூறாமல் விலகிக்கொள்ள தங்களுக்கு முழு உரிமையும் உள்ளது. இருப்பினும் ஆய்வில் இருந்து விலகுவதற்கு முன் ஆராய்ச்சி குழுவுடன் கலந்து ஆலோசிப்பது உகந்தது என பரிந்துரைக்கப்படுகின்றது.

ஆராய்ச்சியாளர் கையொப்பம்	பங்கேற்பாளர் கையொப்பம்
ஆராய்ச்சியாளரின் பெயர்	பங்கேற்பாளர் பெயர்
இடம் : தேதி :	இடம் : தேதி :

ஆராய்ச்சி ஒப்புதல்படிவம்

ஆராய்ச்சியின் தலைப்பு : "புதியதாக கண்டறியப்படுகின்ற தொழுநோயாளிகளுக்கு ஏற்படும் குறைபாடுகளின் தீவிரத்தை அறிவதற்கான ஆய்வு"

ஆராய்ச்சி செய்பவரின் பெயர் : மருத்துவர் அ. தனச்செல்வி

ஆராய்ச்சி மையம் : ராஜீவ்காந்திஅரசுபொதுமருத்துவமனை, சென்னை – 600003

_____ எனும் நான், எனக்கு கொடுத்துள்ள தகவல் தாளைப் படித்து புரிந்து கொண்டேன். நான் பதினெட்டு வயதைக் கடந்துள்ளதால் என்னுடைய சுயநினைவுடனும், முழு சுதந்திரதுடனும், இந்த ஆராய்ச்சியில் என்னை சேர்த்துக் கொள்ள சம்மதிக்கின்றேன்.

1. **நான் எனக்கு அளிக்கப்பட்ட ஒப்புதல் படிவத்தையும், தகவல்களையும் படித்து புரிந்து கொண்டேன்.**
2. **ஒப்புதல் படிவத்தில் உள்ள தகவல்கள் எனக்கு விளக்கிக் கூறப்பட்டன.**
3. **ஆய்வின் தன்மை பற்றி எனக்கு விளக்கப்பட்டது.**
4. **என்னுடையஉரிமைகளையும், பொறுப்புகளையும் ஆராய்ச்சியாளர் விளக்கிக் கூறினார்.**
5. **நான் இதுவரை எடுத்துள்ள, எடுத்துகொண்டிருக்கும் அனைத்து விதமான சிகிச்சை முறைகளையும் ஆராய்ச்சியாளரிடம் கூறியுள்ளேன்.**
6. **இந்த ஆராய்ச்சியினால் ஏற்படும் தீமைகள் பற்றி விளக்கப்பட்டன.**
7. **நான் ஆராய்ச்சியாளருடன் ஒத்துழைப்பேன் என்றும் ,எனக்கு ஏற்படக் கூடிய அசாதாரணமான நிகழ்வுகள் பற்றியும் உடனடியாக ஆராய்ச்சியாளரிடம் தெரிவிப்பேன் என்றும் உறுதிகூறுகிறேன் .**
8. **நான் கடந்த_____மாதங்களாக எந்த விதமான ஆய்வுகளிலும் பங்கேற்கவில்லை.**
9. **எனக்கு செய்யப்படும் அனைத்து பரிசோதனைகளும் (உதாரணம்: இரத்தம் எடுத்தல்) என்நோயின் தன்மையை அறிவதற்காக செய்யப்படுபவை என்பதை அறிகிறேன்.**
10. **இந்த ஆய்விலிருந்து எப்போது வேண்டுமானாலும் எக்காரணமும் கூறாமல் நான் என்னை விடுவித்துக் கொள்ளலாம் என்பதை அறிவேன், மற்றும் இதனால் எனக்குத் தரப்படும் சிகிச்சைக்கு எந்த பாதிப்பும் வராது என்பதை அறிவேன்.**
11. **ஆராய்ச்சியாளர்கள் இந்த ஆய்வில் எனது பங்களிப்பை எந்த நேரத்திலும் எக்காரணமும் கூறாமல் என்சம்மதம் இல்லாமலும் என்னை விலக்கி விட முடியும் என்பதை அறிவேன்.**

12. **என்னிடம் இருந்து பெறப்படும் தகவல்களை அரசு வரைமுறை அதிகாரிகள் ஆகியோர்களுடன் பகிர்ந்துகொள்ள ஆராய்ச்சியாளர்களுக்கு அனுமதி அளிக்கிறேன்.**
13. **என்னிடம் பெறப்படும் தகவல்கள் பொதுவாக பிரசுரிக்கப்பட்டாலும், என்னுடைய அடையாளம் இரகசியமாக வைக்கப்படும் என்பதை அறிவேன்.**
14. **எனக்கு திருப்தி அளிக்கும் வகையில் என்னிடம் கேட்கப்பட்ட கேள்விகளுக்கு நான் பதில் அளித்துள்ளேன்.**
15. **இந்த ஆராய்ச்சியில் பங்கேற்க தன்னிச்சையாக முழுமனதுடன் நான் சம்மதிக்கிறேன்.**

இந்த ஆய்வின் போது எனக்கு என்ன சந்தேகம் ஏற்பட்டாலும் ஆராய்ச்சியாளரை தொடர்பு கொள்ளலாம் என்பதை அறிவேன். இந்த ஒப்புதல் படிவத்தில் கையெழுத்திடுவதன் மூலம் இங்கு தரப்பட்டிருக்கும் அனைத்து தகவல்களும் தெளிவாகக் கூறப்பட்டு என்னால் முழுமையாக புரிந்துகொள்ளப்பட்டது என்பதை சான்றளிக்கிறேன். இந்த ஒப்புதல் படிவத்தின் நகல் என்னால் பெற்றுக்கொள்ளப்பட்டது.

பங்கேற்பவரின்கையொப்பம் : **இடம்** :

கட்டைவிரல்ரேகை : **தேதி** :

பங்கேற்பவரின்பெயர் :

விலாசம் :

ஆய்வாளரின்பெயர் :

இடம் :

தேதி :

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI-3

EC Reg No.ECR/270/Inst./TN/2013
Telephone No. 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To
Dr. Dhanaselvi H,
Postgraduate M.D.D.V.L.(Dermatology, Venereology and Leprosy),
Madras Medical College,
Chennai – 600 003.

Dear Dr.Dhanaselvi H,

The Institutional Ethics Committee has considered your request and approved your study titled **"Clinical study of deformities in newly diagnosed leprosy patients". No.19112014.**

The following members of Ethics Committee were present in the meeting held on 11.11.2014 conducted at Madras Medical College, Chennai-3.

1. Dr.C.Rajendran, M.D.,	: Chairperson
2. Dr.R.Vimala, M.D., Dean, MMC, Ch-3	: Deputy Chairperson
3. Prof.B.Kalaiselvi, M.D., Vice-Principal, MMC, Ch-3	: Member Secretary
4. Prof.R.Nandini, M.D., Inst.of Pharmacology, MMC	: Member
5. Prof.P.Ragumani, M.S., Professor, Inst.of Surgery, MMC	: Member
6. Prof.Md.Ali, M.D., D.M., Prof. & HOD of Medl.G.E., MMC	: Member
7. Prof.K.Ramadevi, Director i/c, Inst.of Biochemistry, MMC	: Member
8. Prof.Saraswathy, M.D., Director, Pathology, MMC, Ch-3	: Member
9. Prof.S.G.Sivachidambaram, M.D., Director i/c, Inst.of Internal Medicine, MMC	: Member
10.Thiru S.Rameshkumar, Administrative Officer	: Lay Person
11.Thiru S.Govindasamy, B.A., B.L.,	: Lawyer
12.Tmt.Arnold Saulina, M.A., MSW.,	: Social Scientist

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

21/11/14

Member Secretary, Ethics Committee

VICE PRINCIPAL
MADRAS MEDICAL COLLEGE
CHENNAI-3.